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TRANSACTIONS

OF THE

New England

COTTON MANUFACTURERS' ASSOCIATION.

Founded April 20, 1865. Incorporated Dec. 1, 1894.

NO. 70.

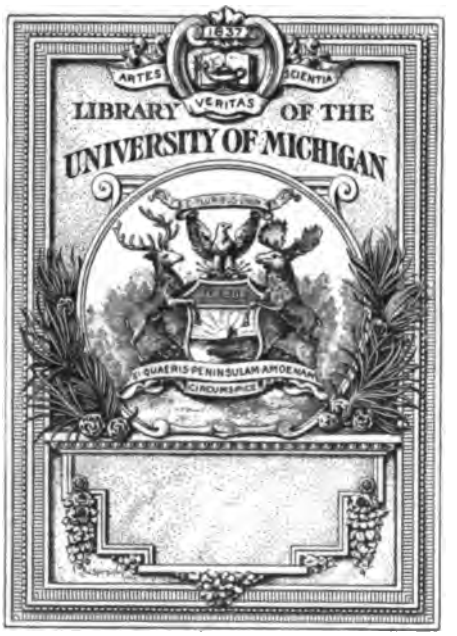
ANNUAL MEETING.

Held in Chipman Hall, 88 Tremont St., Boston, Mass.

APRIL 24-25, 1901.

Office of the Association:
Room 57, International Trust Building, 45 Milk Street,
Corner of Devonshire St., Boston, Mass.

WALTHAM, MASS.:
PRESS OF B. L. BARRY.
1901.



THE GIFT OF

Association

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1550
.N2

NEW ENGLAND

Cotton Manufacturers' Association.

Proposal for

Membership of

Notice to Members.

To make the Cotton Manufacturers' Association an absolutely representative body it must include as many as possible of those who are eligible for membership. It has been found that many who were eligible and desired to join had not done so because not invited. It is hoped that every member will present the matter to non-members among his associates. The accompanying blank proposition for membership can be detached from the cover at the row of perforations.

NEW ENGLAND

Cotton Manufacturers' Association.

Proposal for

Membership of

Application Received

190 .

Action by Board of Government, *favorable.*

190 .

Voted by the Association, *elected,*

190 .

New England Cotton Manufacturers' Assc

Room 57, International Trust Bu

45 MILK STREET,

BOSTON, MASS

PROPOSAL FOR MEMBERS

(When filled out, to be mailed to the Secretary, P. O. Box 3672, Bo Mass., in time for action by the Board of Government, at least one week b a meeting of the Association.)

Mr.

Position,

P. O. Address,

is proposed for ____ *membership in the* NEW ENGLAND COTT
active or associate

MANUFACTURERS' ASSOCIATION *by* ____
signature of member proposing candidate.

a member of the Association.

Experience of Applicant, (Please state, in full, particulars of detail, giving names, date and nature of work, as fully as convenient.)

The undersigned certifies that the above statements are correct, and agrees that, if elected to the Association, he will be governed by its rules as long as his connection with it shall continue.

Date, ... 190 .

signature of candidate.

TRANSACTIONS

OF THE

New England

COTTON MANUFACTURERS' ASSOCIATION.

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Room 57, International Trust Building, 45 Milk Street,
Corner of Devonshire St., Boston, Mass.

WALTHAM, MASS.:
PRESS OF E. L. BARRY,
1901.

ENTERED ACCORDING TO ACT OF CONGRESS
IN THE YEAR 1901
BY THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION,
IN THE OFFICE OF THE LIBRARIAN OF CONGRESS
AT WASHINGTON.

By vote of the Board of Government, the price of the *Transactions* is $5.00 per copy to non-members. The price of this issue and the one previous is $1.00 each to members, and the prices of copies previous to Volume 61, is 50 cents to members, but each member is entitled to a copy as a part of the privilege of membership.

CHARTER.

No. 6091.

Commonwealth of Massachusetts.

BE IT KNOWN, That whereas, EDWARD W. THOMAS, C. J. H. WOODBURY, WILLIAM J. KENT, F. M. MESSENGER, HARRY T. WHITIN, ARTHUR H. LOWE, ALBERT F. KNIGHT, ALFRED M. GOODALE, FRED C. MCDUFFIE and GEORGE W. BEAN have associated themselves with the intention of forming a corporation under the name of the NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION, for the purpose of encouraging scientific investigation and experiment as to the methods of manufacturing cotton; collecting and imparting information relating to this industry, promoting social intercourse among its members; and establishing and maintaining a library of works on textiles in the city of Boston, and have complied with the provisions of the Statutes of this Commonwealth in such case made and provided, as appears from the certificate of the President, Treasurer and Directors of said corporation, duly approved by the Commissioner of Corporations, and recorded in this office.

Now, Therefore, I, WILLIAM M. OLIN, Secretary of the Commonwealth of Massachusetts, do hereby certify that said EDWARD W. THOMAS, C. J. H. WOODBURY, WILLIAM J. KENT, F. M. MESSENGER, HARRY T. WHITIN, ARTHUR H. LOWE, ALBERT F. KNIGHT, ALFRED M. GOODALE, FRED C. MCDUFFIE and GEORGE W. BEAN, their associates and successors, are legally organized and established as and are hereby made an existing corporation under the name of the

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION,

with the powers, rights and privileges, and subject to the limitations, duties and restrictions which by law appertain thereto.

Seal of the Commonwealth of Massachusetts.

Witness my official signature hereunto subscribed, and the seal of the Commonwealth of Massachusetts hereunto affixed this first day of December, in the year of our Lord one thousand eight hundred and ninety-four.

WILLIAM M. OLIN,

Secretary of the Commonwealth.

157070

Commonwealth of Massachusetts.

(Acts of 1895, Chap. 163.)

AN ACT TO AUTHORIZE THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION TO HOLD ITS MEETINGS WITHOUT THE COMMONWEALTH.

Be it enacted, etc., as follows:

SECTION 1. The New England Cotton Manufacturers' Association is hereby authorized to hold its meetings in any state or territory of the United States and in the District of Columbia; provided, however, that its annual meeting shall be held in this Commonwealth at least once in five years.

SECT. 2. This act shall take effect upon its passage. [Approved March 23, 1895.]

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

FOUNDED APRIL 20, 1865.

INCORPORATED DECEMBER 1, 1894.

CONSTITUTION AND BY-LAWS.

ACTIVE MEMBERS.

ARTICLE 1. Any person who is actively engaged as President, Treasurer, Agent, Superintendent or Manager in the manufacture, printing or finishing of cottons shall be eligible for active membership.

ELECTION OF MEMBERS.

ARTICLE 2. All nominations for membership shall be made in writing, at least one week before the date of any regular meeting, and shall be considered by the Board of Government, and reported to the meeting, favorably or adversely, for the action of the Association. *Provided*, that in case the Board shall decide to report adversely upon any nomination, the member who shall have made it shall be informed of the intention so to report, in order that he may have an opportunity to withdraw the name. Upon such report active members may be admitted, if they obtain a majority of votes of the members present and voting therefor, by acceptance in writing, and paying an admission fee of ten dollars, and maintaining their membership by the payment of an annual assessment not exceeding ten dollars.* Any member failing to pay two successive assessments shall cease to be a member at the end of six months from the date when such second assessment shall become due. Any member may withdraw from the Association upon payment of all arrearages, first giving notice of his intention so to do, in writing, to the Secretary, and the Board of Government may accept such resignation; and any member may be expelled for cause,

* This assessment has never exceeded five dollars for active members and ten dollars for associate members.

at any regular meeting, two-thirds of the members present voting therefor.

ASSOCIATE MEMBERS.

ARTICLE 3. Persons engaged in the manufacture of cotton or cotton fabrics, or the manufacture of textile machinery, or industries kindred to the cotton manufacture, may become associate members of the Association. The methods of application, nomination, election and withdrawal from the Association being under the same conditions as those provided for active members in Article 2, excepting that this class of membership does not carry with it the privilege of voting or speaking, except by permission from the Board of Government or a vote of the Association to allow permission.

The initiation fee for associate members shall be twenty-five dollars, and the annual assessment shall be double the sum annually voted for active members.

Associate members may be expelled by a majority vote of the Board of Government.

HONORARY MEMBERS.

ARTICLE 4. Honorary members may be elected, when recommended by the Board of Government, at any regular meeting of the Association, who shall be enrolled as such, and shall be entitled to attend the meetings of the Association and participate in its proceedings, without the right to vote. They shall not be subject to payment of admission fees or assessments. No person actively engaged in cotton manufacture shall be eligible to honorary membership.

ARTICLE 5. It shall be the duty of all members of the Association to make returns to the Secretary of such statistics as may be called for by him, under the direction of any committee duly appointed for the collection of statistics, when not incompatible with private interests.

OFFICERS.

ARTICLE 6. The officers of this Association shall be a President, two Vice-Presidents, six Directors, a Treasurer, Secretary, and Auditor of Accounts.

ELECTION OF OFFICERS.

ARTICLE 7. At each annual meeting there shall be chosen by ballot a President, two Vice-Presidents and two Directors; the President and Vice-Presidents to serve one year, and the two Directors shall be chosen for terms of three years.

DUTIES OF OFFICERS.

ARTICLE 8. The President, or in his absence the senior Vice-President present, shall preside at all meetings of the Association and of the Board of Government. All officers shall hold their respective offices until their successors shall be chosen and accept their positions.

ARTICLE 9. The President, Vice-Presidents and Directors shall constitute a Board of Government, and have under their care and direction all matters pertaining to the management of the Association; and five of their number shall constitute a quorum for the transaction of business. Meetings of the board may be called by the President, at such time and place as he may deem expedient, giving each member a written or printed notice of the same at least five days before the day of meeting. At their first meeting the board shall elect a Treasurer, Secretary, and Auditor of Accounts for the year ensuing, and fix the amount of compensation of the Secretary. All vacancies in their board occasioned by death or resignation shall be filled by the board; and the persons so elected shall hold their offices until the next annual meeting. The board may, from time to time, as they shall deem expedient, appoint committees, from among their own board or from the members at large, to collect statistical information, examine new inventions or processes in manufacturing goods, as also to prepare essays on subjects of interest to the Association.

ARTICLE 10. The Treasurer shall keep a book in which all receipts and payments of money shall be entered, collect all moneys due the Association, and disburse the same upon the written order of the Board of Government. At the annual meeting in each year he shall make an exhibit of his accounts, or oftener if the Board of Government require it. He shall notify the members of assessments voted, and cause them to be collected in a reasonable time.

ARTICLE 11. The Secretary shall attend all meetings of the Association and of the Board of Government, and keep accurate records of

their doings. In the absence of the Secretary at any meeting, a Secretary *pro tem.* may be appointed by the presiding officer, who shall be sworn to do all things, while in office, required of the Secretary.

ARTICLE 12. The Auditor shall examine the accounts of the Treasurer annually, and report at each meeting the state of the finances.

MEETINGS.

ARTICLE 13. The annual meeting of the members of the Association shall be held on the last Wednesday of April, or at such other time, and at such hour and place as the Board of Government may appoint. There shall also be a semi-annual meeting of the Association on the last Wednesday of October, in each and every year, or at such other time, and at such place and hour as the Board of Government may appoint.

Special meetings may be called by the Board of Government whenever they deem it expedient, or upon the written application of any ten members, made to the Secretary.

ARTICLE 14. All meetings of the members of the Association shall be in pursuance of a written or printed notice, addressed to each member, with the name of the President or Secretary attached thereto, and deposited in the Post Office ten days at least before the day of meeting, specifying the time and place of meeting; and at all such meetings fifteen members shall constitute a quorum for the transaction of business.

ARTICLE 15. Amendments to the By-Laws may be made at any stated meeting of the Association by a two-thirds vote; *provided*, notice of such proposed amendment be given in writing at a previous meeting, and also notice be given to each member by the Secretary, of the pendency of such amendment, ten days at least before any such meeting.

BOARD OF GOVERNMENT.

1901.

PRESIDENT.

CHARLES H. FISH, ... DOVER, N. H.

VICE-PRESIDENTS.

GEORGE H. HILLS, ... FALL RIVER, MASS.
HERBERT E. WALMSLEY, ... NEW BEDFORD, MASS.

DIRECTORS.

ALFRED E. ADAMS, ... WHITINSVILLE, MASS.
WILLIAM D. HARTSHORNE, . . . LAWRENCE, MASS.
JAMES R. MACCOLL, ... PAWTUCKET, R. I.
W. B. SMITH WHALEY, ... COLUMBIA, S. C.
A. TENNY WHITE, ... MANVILLE, R. I.
GEORGE F. WHITTEN, ... MANCHESTER, N. H.

AUDITOR.

C. E. ROBERTS, ... BOSTON, MASS.

SECRETARY AND TREASURER.

C. J. H. WOODBURY, P. O. BOX 3672, BOSTON, MASS.

OFFICE OF THE ASSOCIATION:

ROOM 57, INTERNATIONAL TRUST BUILDING, 45 MILK STREET, CORNER OF DEVONSHIRE STREET, BOSTON, MASS.

OFFICERS OF THE ASSOCIATION,

FROM THE FIRST ORGANIZATION.

PRESIDENTS.

Ezekiel A. Straw,	1865–78	Edw. W. Thomas,	1894–95
Amos D. Lockwood,	1878–80	A. M. Goodale,	1895–96
John Kilburn,	1880–83	Arthur H. Lowe,	1896–97
William C. Lovering,	1883–85	Russell W. Eaton,	1897–98
Richard Garsed,	1885–86	Stephen A. Knight,	1898–99
J. S. Ludlam,	1886–88	Frederick E. Clarke,	1899–99
Henry F. Lippitt,	1888–89	D. M. Thompson,	1900–01
Walter E. Parker,	1889–92	CHARLES H. FISH,	1901–
Robert McArthur,	1892–94		

VICE-PRESIDENTS.

Amos D. Lockwood,	1865–77	Arnold B. Sanford,	1888–91
William A. Burke,	1865–73	Robert McArthur,	1889–92
John C. Palfrey,	1873–76	Simeon B. Chase,	1891–93
Edward Atkinson,	1876–78	E. W. Thomas,	1892–94
A. G. Cumnock,	1877–80	A. M. Goodale,	1893-95
Charles Nourse,	1878–81	William J. Kent,	1894–97
William F. Goulding,	1880–83	Fred. C. McDuffie,	1895–00
Richard Garsed,	1881–85	Henry T. Whitin,	1897–00
J. S. Ludlam,	1883–86	C. H. Richardson,	1900–01
Walter E. Parker,	1885–89	GEORGE H. HILLS,	1900–
Richard B. Borden,	1886–88	H. E. WALMSLEY,	1901–

DIRECTORS.

J. S. Davis,	1865–69	A. G. Cumnock,	1869–77
Charles Nourse,	1865–78	F. E. Clarke,	1869–75
Phineas Adams,	1865–74	S. S. Spencer,	1887–90
William P. Haines,	1865–69	E. W. Thomas,	1888–92
Thomas J. Borden,	1865–78	William W. Whitin,	1888–93
Daniel D. Crombie,	1865–68	Robert R. Smith,	1889–92
Cyrus I. Barker,	1875–80	Alfred M. Goodale,	1890–93
Hervey Kent,	1877–81	William J. Kent,	1891–94
David J. Johnston,	1878–82	Herman F. Straw,	1891–93
Walter Paine, 3d,	1878–80	Fred C. McDuffie,	1892–95
Chas. L. Lovering,	1878–83	George W. Bean,	1892–95
Richard Garsed,	1880–81	F. M. Messenger,	1893–95
William H. Jennings,	1880–83	Arthur H. Lowe,	1894–96
Chas. D. McDuffie,	1881–83	Henry T. Whitin,	1894–97
Walter E. Parker,	1881–85	Herbert L. Pratt,	1895–98
John W. Danielson,	1881–85	Stephen A. Knight,	1895–98
William E. Barrows,	1882–83	Russell W. Eaton,	1896–97
Rufus A. Maxfield,	1883–86	Albert F. Knight,	1893–99
George W. Weeks,	1883–86	John Eccles,	1895–99
Henry S. Howe,	1883–87	C. H. Richardson,	1897–00
Richard B. Borden,	1883–86	George H. Hills,	1897–00
O. S. Brown,	1885–91	John T. Meats,	1898–01
Henry F. Lippitt,	1885–88	Charles H. Fish,	1900–01
Wilbur A. Stiles,	1886–88	Herbert E. Walmsley,	1900–01
Stephen N. Bourne,	1886–91	GEO. F. WHITTEN,	1898–
John Kilburn,	1870–80	A. TENNY WHITE,	1899–
William P. Haines,	1874–78	ALFRED E. ADAMS,	1899–
Robert McArthur,	1886–89	W. B. SMITH WHALEY,	1901–
A. M. Wade,	1868–69	Wm. D. HARTSHORNE,	1901–
D. J. Johnston,	1869–70	JAMES R. MacCOLL,	1901–

AUDITORS.

BENJAMIN SAUNDERS,	1865–71	J. HERBERT SAWYER,	1882–00
JOHN C. PALFREY,	1871–73	C. E. ROBERTS,	1900–
HENRY D. SULLIVAN,	1873–82		

SECRETARY AND TREASURER.

AMBROSE EASTMAN,	1865–94	C. J. H. WOODBURY,	1894

MEMBERS OF THE ASSOCIATION.

April 26, 1901.

Members of the Association are respectfully requested to scrutinize the following list, and advise the Secretary, P. O. Box 3672, Boston, Mass., of change in address, or any error in regard to their names.

As a number of members rejoined the Association after severing their first membership, the date of their earliest election is given.

HONORARY MEMBERS.

George Arms	Grand Hotel	New York City	Oct. 16, 1872.
Ambrose Eastman	53 State St.	Boston, Mass.	Sept. 27, 1894.
Samuel Webber	Hydraulic Engineer	Charlestown, N. H.	Apr. 28, 1897.

ACTIVE MEMBERS.

Alfred E. Adams	Agt. Whitinsville Cotton Mills Agt. Linwood Mills	Whitinsville, Mass.	Apr. 27, 1887.
John S. Adams, Jr.	Supt. Adams Bros. Mfg. Co.	120 Commercial St., Adams, Mass.	Apr. 29, 1896.
Joseph D. Aiken	Asst. Supt. Ponemah Mills	Taftville, Conn.	Oct. 28, 1891.
F. S. Akin	Supt. Cornell Mills	Fall River, Mass.	Sept. 27, 1894.
Charles T. Aldrich	Treas. Aldrich Mfg. Co.	Box 34, Providence, R. I.	Apr. 28, 1886.
Franklin Allen	Supt. Boott Mills	Lowell, Mass.	Oct. 18, 1900.
George E. Ames	Mech. Supt. Lawrence Mfg. Co.	Lowell, Mass.	Apr. 24, 1895.
William Ames	Treas. Fletcher Manufg. Co., Box 83,	47 Charles St., Providence, R. I.	Apr. 30, 1879.
Charles B. Amory	Treas. Hamilton Manufg. Co.	70 Kilby St., Boston, Mass.	Apr. 25, 1894.
Frederic Amory	Treas. Nashua Mfg. Co. and Jackson Mfg. Co.	Room 51, Simmons B'l'd., 40 Water St., Boston, Mass.	Apr. 27, 1899.
Thomas Armstrong	Supt. No. Pownal Mfg. Co.	No. Pownal, Vt.	Oct. 27, 1897.
Abel T. Atherton	Machine Maker	Bay Side, R. I.	Oct. 16, 1872.

Edward Atkinson	Prest. Boston Mfrs. Mu. Fire Ins. Co.	31 Milk St., Boston, Mass.	Apr. 19, 1871.
E. W. Atkinson	Stoddard, Haserick, Richards & Co.	152 Congress St., Boston, Mass.	Oct. 27, 1886.
H. C. Atwood	Treas. Williamsville Manufg. Co.	Providence, R. I.	Apr. 29, 1885.
James A. Atwood	Agt. Wauregan Co. and Quinebaug Co.	Wauregan, Conn.	Oct. 28, 1891.
John Walter Atwood	Supt. Wauregan Co.	Wauregan, Conn.	Oct. 24, 1895.
W. E. Atwood	Secy. and Asst. Treas. Williamsville Manufg. Co.	Killingly, Conn.	Sept. 27, 1894.
George A. Ayer	Supt. City Mfg. Corp. Supt. Bristol Mfg. Corp.	123 Fifth St., New Bedford, Mass.	Apr. 24, 1895.
Nathaniel F. Ayer	Asst. Mgr. Farwell Bleachery	518 Beacon St., Boston, Mass.	Apr. 25, 1901.
Henry A. Bailey	Agt. Chicopee Manufg. Co.	Chicopee Falls, Mass.	Oct. 25, 1893.
Dickerson G. Baker	Asst. Mech. Eng., American Thread Co.	Willimantic, Conn.	Oct. 18, 1900.
Edwin H. Baker	Bliss, Fabyan & Co., Box 2899	117 Duane St., New York City, N. Y.	Apr. 24, 1878.
Edward R. Ballou	Treas. Ballou Yarn Converting Co.,	189 Charles St., Providence, R. I.	Apr. 25, 1894.
William P. Bancroft	Vice-Pres. Joseph Bancroft & Sons Co.	Wilmington, Del.	Oct. 31, 1883.
Louis B. Barker	Agt. United States Cotton Co.	Central Falls, R. I.	Apr. 27, 1899.
Lewis E. Barnes	Agt. Pemberton Co. & Methuen Co.,	Methuen, Mass.	Oct. 24, 1895.
William A. Barrell	Agt. Lawrence Duck Co.	Lawrence, Mass.	Apr. 30, 1884.
Thomas Barrett, Jr.	Pres. Langley & Aiken Mills	Augusta, Ga.	Apr. 26, 1900.
Edwin N. Bartlett	Supt. Sigourney and Rockdale Mills,	North Oxford, Mass.	Apr. 29, 1891.
Daniel Moore Bates	Asst. Supt. Joseph Bancroft & Sons Co.,	Rockford, Wilmington, Del.	Apr. 28, 1898.
Joseph P. Battles	Treas. Lewiston Mach. Co.	Lewiston, Me.	Oct. 24, 1895.
Edward C. Beach	Supt. Gate City Cotton Mills	East Point, Georgia	Oct. 5, 1899.
George W. Bean	Agt. Androscoggin Mills	Lewiston, Me.	Apr. 17, 1872.
Robert Beatty	Robert Beatty & Co.	Coral and Adams Sts., Philadelphia, Pa.	Oct. 27, 1897.
Truman Beckwith	Treas. Dyerville Manufg. Co.	Box 171, Providence, R. I.	Apr. 27, 1892.
John W. Bell	Asst. Treas. and Mgr. Smith & Dove Manufg. Co.	Andover Mass.	Oct. 27, 1897.
A. C. Bent	Agt. Safety Seamless Pocket Co.	Taunton, Mass.	Oct. 27, 1897.
W. N. Blackstone	Treas. Attawaugan Co. Treas Totokett Mills Co	Norwich, Conn.	Apr. 29, 1896.
William W. Blades	Gen. Supt. Lorraine Mfg. Co.	135 Mineral Spring Ave., Pawtucket, R. I.	Oct. 25, 1893.
T. Ashby Blythe	Proprietor Ashby Cotton Mills	114 Chestnut St., Philadelphia, Pa.	Oct. 27, 1897.

John P. Bodge	Treas. Arkwright Mills	Fall River, Mass.	Oct. 27, 1897.
Jefferson Borden, Jr.	Supt. Fall River Bleachery Co.	Fall River, Mass.	Apr. 27, 1899.
Nathaniel B. Borden	Treas. Barnard Manufg. Co.	Fall River, Mass.	Oct. 15, 1873.
Richard B. Borden	Treas. Richard Borden Mfg. Co. Treas. Troy C. & W. Mfg. Co.	Fall River, Mass.	July 18, 1866.
Thomas J. Borden	326 North Main St.	Fall River, Mass.	Apr. 20, 1865.
E. S. Boss	Agt. Willimantic Linen Co.	Willimantic, Conn.	Oct. 29, 1879.
Henry D. Bourne	Treas. Hooksett Mills	Manchester, N. H.	Oct. 18, 1900.
Stephen N. Bourne	Agt. Stark Mills	Manchester, N. H.	Oct. 21, 1869.
Frank A. Bowen	Supt. Appleton Co.	Lowell, Mass.	Apr. 28, 1897.
Arthur F. Brackett	Supt. Royal Arctic & Valley Queen Mills,	Riverpoint, R. I.	Oct. 24, 1895.
A. W. Brainerd	Gen. Mgr. Millville Mfg. Co. and May's Landing Water Power Co.	Millville, N. J.	Apr. 28, 1898.
Ernest Bridge	Supt. Jas. Chadwick & Bro. Ltd.	Jersey City, N. J.	Apr. 24, 1895.
Christopher P. Brooks	Managing Director New Bedford Textile School	New Bedford, Mass.	Apr. 28, 1897.
Henry R. Brown	Supt. Hope Co. and Phenix Mill, Box 56,	Phenix, R. I.	Apr. 28, 1897.
Isaac A. Brown	Treas. Narragansett Mills . Box 324,	Fall River, Mass.	Sept. 29, 1898.
James W. Brown	P. O. Box 312,	Ipswich, Mass.	Oct. 24, 1895.
O. S. Brown	Agt. Salmon Falls Manufg. Co.	Salmon Falls, N. H.	Apr. 21, 1875.
Thomas J. Brown	George Brown's Sons	Mt. Joy, Penn.	Oct. 27, 1897.
E. C. Bucklin	Treas. Interlaken Mills and Treas. Harris Mfg. Co.	Butler's Exchange, Box 289, Providence, R. I.	Apr. 25, 1883.
Robert Burgess	Agt. Grinnell Mfg. Corp.	745 County St., New Bedford, Mass.	Apr. 27, 1892.
Edward N. Burke	Lowell Machine Shop	Lowell, Mass.	Apr. 28, 1880.
Alfred H. Burnham	Mgr. Glasgow Mills	Huntington and Jasper Sts., Philadelphia, Pa.	Apr. 26, 1900.
Hervey Burnham	Supt. Beaver Mills and Eclipse Mill	295 Beaver St., North Adams, Mass.	Apr. 27, 1899.
W. R. Burnham		Norwich, Conn.	Apr. 29, 1885.
William D. Cadwell	Agt. Nashua Mfg. Co., 67 Concord St.,	Nashua, N. H.	Apr. 19, 1871.
William H. Cadwell	Agt. Jackson Company	Nashua, N. H.	Apr. 26, 1900.
John P. Campbell	Supt. New York Mills,	New York Mills, Oneida Co., N. Y.,	Sept. 22, 1896.
Byron F. Card	Agt. Howland Mills	New Bedford, Mass.	Apr. 25, 1888.
George A. Chace	Treas. Bourne Mills	Fall River, Mass.	Apr. 25, 1877.
John W. Chafee	Pres. and Treas. The Sibley Mfg. Co.	Augusta, Ga.	Oct. 18, 1900.
James C. Chalmers	Vice-Pres. Renfrew Mfg. Co.	Adams, Mass.	Oct. 5, 1899.
Simeon B. Chase	Treas. King Philip Mills	Fall River, Mass.	Apr. 21, 1875.
Clarence N. Childs	Asst. Supt. Hamilton Manufg. Co.	43 Pine St., Lowell, Mass.	Apr. 24, 1895.
Elmer G. Childs	Agt. Boston Duck Co.	Bondsville, Mass.	Oct. 26, 1892.
Jno. H. C. Church	Asst. Treas and Sec. Monument Mills,	Gt. Barrington, Mass.	Apr. 28, 1897.
Ernest E. Clark	Mech. Supt. Montreal Cotton Co.	Valleyfield, P. Q.	Apr. 29, 1896.

George A. Clark	Supt. Manchester Mills	Manchester, N. H.	Oct. 25, 1882.
Alfred Clarke	Gen'l Mgr.	23 Central St., Boston, Mass.	Apr. 30, 1879.
E. N. Clemence	Sec. and Treas. Eagle & Phenix Mills and Agt. for Receivers	Columbus, Ga.	Apr. 28, 1897.
W. H. Cloher, Jr.	Treas. and Agt. Utica Cotton Co.	Capron, Oneida Co., N. Y.,	Sept. 22, 1896.
Josiah G. Coburn		99 Washington St., Newton, Mass.	Apr. 20, 1865.
Charles H. Collins	Supt. Berkeley Co.	Ashton, R. I.	Apr. 26, 1900.
John A. Collins	Supt. American Linen Co.	73 Cottage St., Fall River, Mass.	Oct. 31, 1883.
B. B. Comer	Pres. and Treas. Avondale Cotton Mills	Birmingham, Ala.	Apr. 26, 1900.
Frank B. Comins	Treas. American Moistening Co.	150 Devonshire St., Room 67, Boston, Mass.	Oct. 28, 1891.
Caesar Cone	Pres. Proximity Mfg. Co.	Greensboro, N. C.	Apr. 26, 1900.
John J. Connell	Supt. Cohannet Mills	Taunton, Mass.	Apr. 27, 1892.
Peter H. Corr	Treas. Greenwich Bleachery	Taunton, Mass.	Apr. 25, 1901.
Frank H. Cotton	Mgr. Hope Mills Mfg. Co.	Hope Mills, N. C.	Apr. 27, 1899.
Alphonse S. Covel	Treas. Tremont and Suffolk Mills,	P. O. Box 1716, 70 Kilby St., Boston, Mass.	Oct. 31, 1877.
William W. Crapo	Pres. Wamsutta Mills	New Bedford, Mass.	Sept. 29, 1898.
William J. Cray	Supt. Aldrich Mfg. Co.	Moosup, Conn.	Apr. 25, 1901.
P. T. Creed	Agt. Hopewell Mills	Box 356, Taunton, Mass.	Sept. 22, 1896.
John B. Cudlip	Supt. Gibson Cotton Mill	Marysville, N. Bruns.	Apr. 28, 1897.
H. H. Culver	Supt. Elizabeth Poole Mills	39 Ashland St., Taunton, Mass.	Apr. 28, 1897.
Henry S. Culver	Supt. Westville Cotton Mills	Taunton, Mass.	Apr. 28, 1897.
A. G. Cumnock	Treas. Appleton Co.	Box 2284, Lowell, Mass.	Oct. 28, 1885.
Andrew J. Currier	Mgr. Albion and Valley Falls Co.	Valley Falls, R. I.	Apr. 25, 1888.
T. B. Dallas	Treas. Phœnix Cotton Mills Treas. Dallas Manufg. Co.	Box 386, Nashville, Tenn.	Oct. 24, 1895.
Philip Dana	Supt. Dana Warp Mills	Westbrook, Me.	Sept. 29, 1898.
Woodbury K. Dana	Treas. Dana Warp Mills	Westbrook, Me.	Apr. 25, 1888.
Albert W. Danforth	Consulting Engr. Shanghai Cot. Cloth Mills,	Shanghai, China 881 Bridge St., Lowell, Mass.	Apr. 27, 1881.
A. Lockwood Danielson	Asst. Treas. Quinebaug Co.,	Box 900, Providence, R. I.	Sept. 27, 1894.
J. DeForest Danielson	Asst. Treas. Lockwood Co. & Lewiston Bleachery & Dye Works	Providence, R. I.	Sept. 27, 1894.
John W. Danielson	Treas. Lockwood Co. and Ponemah Mills	Box 900, Providence, R. I.	Jan. 15, 1868.
B. D. Davol	Pres. Barnard Mfg. Co.	P. O. Box 418, Fall River, Mass.	Apr. 25, 1877.
Albert Deabill	Supt. Lowell Hosiery Co.	Lowell, Mass.	Apr. 25, 1901.
James C. Deane	Vice-Pres. Mass. Tool Co.	19 High St., Greenfield, Mass.	Apr. 25, 1894.
Augustus De Cort	Treas. Beacon Mfg. Co.,	P. O. Box 2815 Boston, Mass.	Apr. 26, 1900.
George DeForest	Treas. Utica Steam Cotton Mills	Utica, New York	Oct. 27, 1897.
William P. Dempsey	Treas. Dempsey Bleachery and Dye Works,	Pawtucket, R. I.	Apr. 28, 1886.

Charles W. Dennett	Agt. Johnson Manufg. Co. / Agt. and Treas. Dunbar Mills Co.	North Adams, Mass.	Oct. 29, 1890.
Edward P. Dennis	Lowell Machine Shop	Lowell, Mass.	Apr. 25, 1888.
Charles A. Denny	Pres. American Card Clothing Co.	Leicester, Mass.	Apr. 25, 1888.
P. Y. DeNormandie	Asst. Treas. Pepperell Mfg. Co.	30 Kilby St., Boston, Mass.	Apr. 29, 1896.
Charles Owen Dexter	Mgr. Canadian Col'd Cotton Mills Co. Ltd.	Hamilton, Ont., Can.	Apr. 24, 1895.
Henry C. Dexter,	Agt. Greene & Daniels Mfg. Co.,	Pawtucket, R. I.	Apr. 25, 1901.
Lewis Dexter, Jr.	Mgr. The Canadian Colored Cotton Mills Co., Ltd.	Milltown, N. B.	Apr. 27, 1899.
Samuel Dibble	Pres. Enterprise Cotton Mills,	Orangeburg, S. C.	Sept. 29, 1898.
F. Dilling	Pres. Dilling Cotton Mills	Kings Mountain, N. C.	Oct. 24, 1895.
Albert W. Dimick	Supt. Fisher Mfg. Co.	Fisherville, Mass.	Apr. 25, 1894.
Bradford C. Divine	Supt. and Mgr. Utica Willow Vale Bleaching Co.	Chadwicks, N. Y.	Apr. 27, 1899.
Robert Dow,	Partner in Solway Mills,	Westerly, R. I.	April 25, 1901.
Eben S. Draper	Agt. Draper Co.	Hopedale, Mass.	Oct. 31, 1888.
George A. Draper	Treas. Draper Co.	Hopedale, Mass.	Oct. 31, 1888.
George Otis Draper	Sec'y Draper Co.	Hopedale, Mass.	Apr. 24, 1895.
William F. Draper	Pres. Draper Co.	Hopedale, Mass.	July 17, 1867.
William F. Draper, Jr.	Draper Co.	Hopedale, Mass.	Oct. 29, 1890.
Frederic C. Dumaine,	Treas. Amory Mfg. Co., Box 2879	64 Ames Building, Boston, Mass.	April 25, 1901.
T. C. Duncan	Pres. and Treas. Union Cotton Mills	Union, S. C.	Apr. 26, 1900.
Joseph M. Dunham	43 Edwards St.,	Springfield, Mass.	Oct. 26, 1892.
Frank H. Dwelly	Treas. Tecumseh Mills	Fall River, Mass.	Apr. 27, 1899.
David H. Dyer	D. H. Dyer & Son, Mill Engineers, P. O. Box 582, 6, 7 and 8 Pocassett Bank Building,	Fall River, Mass.	Oct. 18, 1871.
William A. Eastman	Treas. Lowell Hosiery Co.	Lowell, Mass.	Apr. 24, 1878.
Russell W. Eaton	Agt. Cabot Manufg. Co.	Brunswick, Me.	Oct. 26, 1887.
John Eccles	Agt. Ponemah Mills	Taftville, Conn.	Apr. 27, 1892.
Lawrence V. Elder	Man. Dir. Galveston City Cotton Mills 212 Tremont St.,	Galveston, Texas	Oct. 27, 1886.
Oscar Elsas	Vice-Pres. Fulton Bag & Cotton Mills, P. O. Box 773,	Atlanta, Ga.	Apr. 28, 1897.
Frederick W. Ely	Agt. Columbian Manufg. Co.	Greenville, N. H.	Apr. 25, 1888.
Charles Estes	Vice-Pres. John P. King Mfg. Co.	Augusta, Ga.	Apr. 26, 1900.
H. B. Estes	Agt. Continental Mills	Lewiston, Me.	Apr. 26, 1893.
William Evans	Supt. Richard Borden Mfg. Co.	Fall River, Mass.	Apr. 29, 1896.
Herbert R. Farnum	Supt. Bernon Mills	Georgiaville, R. I.	Apr. 27, 1881.
Charles F. Farrar	Supt. Delaware Cotton Co., Hotel Wilmington,	Box 467, Wilmington, Del.	Oct. 27, 1897.

George E. Farrell	Treas. Utica Spinning Co.	Utica, N. Y.	Oct. 18, 1900.
James T. Ferguson	Supt. Warwick Mills	Centreville, R. I.	Oct. 5, 1899.
Frank S. Field	Supt. & Agt. Massaemit Yarn Mills	Shattuckville, Mass.	Oct. 24, 1895.
William Firth	Pres. American Moistening Co. & Wm. Firth Co.	P. O. Box 1460, 150 Devonshire St., Room 67, Boston, Mass.	Apr. 25, 1888.
Charles H. Fish	Agt. Cocheco Manufg. Co.	Dover, N. H.	Apr. 27, 1887.
Charles W. Fisher,	Asst. Supt. Fisher Mfg. Co.	Fisherville, Mass.	Apr. 25, 1901.
Henry E. Fisher	Vice-Pres. & Agt. Atlanta Cotton Mills	Atlanta, Ga.	Oct. 24, 1895.
Herbert Fisher		Taunton, Mass.	Oct. 29, 1879.
William B. Fitz	Agt. W. Boylston Mfg. Co.	Easthampton, Mass.	Oct. 26, 1892.
Frederick A. Flather	Mech. Engineer & Foreman Lowell Machine Shop	Lowell, Mass.	Apr. 29, 1891.
F. C. Fletcher	Vice Pres. Lawton Spinning Co. 621 Banigan Building,	Providence, R. I.	Oct. 18, 1900.
M. F. Foster		Milford, N. H.	Apr. 17, 1872.
Philip H. Fowler	417 Monmouth St.,	Gloucester City, N. J.	Nov. 30, 1881.
Edward W. France	Dir. of Philadelphia Textile School, 320 So. Broad St.,	Philadelphia, Pa.	Sept. 22, 1896.
Arthur C. Freeman	Supt. Clear Water Bleachery and Mfg. Co. Box 208,	Augusta, Ga.	Apr. 27, 1899.
John W. Fries	Managing Partner, F. & H. Fries,	Winston-Salem, N. C.	Oct. 18, 1900.
C. H. Frisbie	Agt. Attawaugan Co.	Norwich, Conn.	Oct. 29, 1890.

W. T. Galey	Pres. Aberfoyle Manufg. Co.	Chester, Pa.	Apr. 28, 1897.
William Gammell	Agt. Berkeley Co.	Providence, R. I.	Oct. 28, 1885.
James G. Garland		Saco, Me.	Oct. 29, 1879.
Edward T. Garsed	Treas. Hucomuga Mills	Greensboro, N. C.	Apr. 28, 1898.
Joshua Garsed	Wingohocking Mills and National Spinning Co., Frankford	Philadelphia, Pa.	Oct. 27, 1897.
James A. Gary	Alberton Mills . 108 W. German St.,	Baltimore, Md.	Apr. 25, 1883.
James Gee	Supt. Interlaken Dye Works	Fiskville, R. I.	Apr. 28, 1898.
Charles E. Getchell	Supt. Waltham Bleachery and Dye Works P. O. Box 62, 35 Willow St.,	Waltham, Mass.	Oct. 30, 1889.
Daniel Gilligan	Supt. Pocasset and Metacomet Mills,	Fall River, Mass.	Apr. 29, 1896.
William C. Godfrey	Agt. Indian Orchard Co.	Indian Orchard, Mass.	Oct. 29, 1890.
Alfred M. Goodale	Treas. Boston Manufg. Co. 50 State St.,	Boston, Mass.	Apr. 25, 1883.
Louis B. Goodall	Treas. Goodall Worsted Co.	Sanford, Me.	Oct. 5, 1899.
Frederick B. Gordon	Pres. and Gen. Mgr. Columbus Mfg Co.	Columbus, Ga.	Apr. 26, 1900.
Charles H. Gorton	Supt. Columbus Mfg. Co.	Columbus, Ga.	Apr. 25, 1894.
Marcellus Gould	Pres. and Mgr. N. H. Spinning Co.	Penacook, N. H.	Sept. 22, 1896.
George P. Grant, Jr.	Treas. Grant Yarn Co.	Fitchburg, Mass.	Sept. 27, 1894.
D. W. Gray	Supt. Skenandoa Cotton Co.	Utica, N. Y.	Oct. 26, 1892.
R. A. Gray	Supt. Rodman Manufg. Co.	Allenton, R. I.	Apr. 24, 1895.
Stephen Greene	Mill Architect and Engineer Lockwood, Green & Co. 93 Federal St.,	Boston, Mass.	Oct. 27, 1886.

Joseph Warren Greene	Supt. Hamilton Web Co.	Hamilton, R. I.	Apr. 29, 1896.
William C. Greene	Treas. Peace Dale Manufg. Co.	Peace Dale, R. I.	Oct. 27, 1886.
William H. Greene,	Treas. Greene & Daniels Mfg. Co.,	Pawtucket, R. I.	Apr. 25, 1901.
John T. Greenwood	R. Greenwood & Bault 4720 Leiper St.,	Frankford, Philadelphia, Pa.	Apr. 26, 1900.
S. Greenwood	Mgr. Canadian Col'd Cot. Mills Co. Ltd.	Cornwall, Ontario	Oct. 5, 1899.
John Gregson	Agt. Fiskdale Mills	Fiskdale, Mass.	Apr 24, 1895.
Maxwell Grierson	Gen. Mgr. Jas. Chadwick & Bro., Ltd.,	Jersey City, N. J.	Apr. 28, 1898.
Frederick Grinnell	Pres. Gen. Fire Extinguisher Co.	New Bedford, Mass.	Apr. 24, 1878.
David Grove	Supt. U. S. Cotton Co.	Central Falls, R. I.	Apr. 28, 1898.
Henry S. Grove	Pres. Argo Mills Co., 216 Chestnut St.,	Philadelphia, Pa.	Apr. 28, 1898.
Arthur H. Gulliver	Agt. Boston Mfg. Co.	Waltham, Mass.	Apr. 24, 1889.
B. F. Guy	Gen. Supt. Pelzer Manufg. Co.	Pelzer, S. C.	Apr. 24, 1895.
William J. Hadfield	Newburgh Steam Mills, 236 Montgomery St.,	Newburgh, N. Y.	Apr. 27, 1899.
Effingham C. Haight	Treas. Wampanoag Mills	Fall River, Mass.	Apr. 27, 1899.
Frank J. Hale	Agt. Saco and Pettee Machine Shops	Newton Upper Falls, Mass.	Apr. 27, 1892.
Walter B. Hall	Supt. Boston Duck Co.	Bondsville, Mass.	Apr. 25, 1901.
William E. Hall	Treas. Shaw Stocking Co.	Lowell, Mass.	Apr. 27, 1892.
Z. D. Hall	Supt. Berkshire Cotton Mfg. Co. 70 Orchard St., P. O. Box 963,	Adams, Mass.	Oct. 29, 1879.
John H. Hambly	Treas. Quidnick Manufg. Co. 49 Westminster St.,	Providence, R. I.	Apr. 24, 1895.
Arthur M. Hamilton	Supt. Parker Mills . 362 Linden St.,	Fall River, Mass.	Apr. 28, 1897.
John F. Hamlet	Manufacturer 709 Maple St. P. O. Box 160,	Fall River, Mass.	Oct. 31, 1888.
Joseph O. Hannum	Agt. Indian Head Mills of Alabama	Cordova, Ala.	Apr. 30, 1890.
Henry F. Harris	Treas. West Boylston Manufg. Co. 340 Main St.,	Worcester, Mass.	Apr. 30, 1890.
John J. Hart	Pres. and Gen. Mgr. Charlton Manufg. Co. P. O. Box 94,	Pawtucket, R. I.	Apr. 24, 1895.
William D. Hartshorne	Agt. Arlington Mills	Lawrence, Mass.	Apr. 27, 1899.
Samuel E. Hathaway	Supt. Fall River Iron Works Co.	Fall River, Mass.	Sept. 27, 1894.
William Hathaway	Supt. Barnard Manufg. Co.	Fall River, Mass.	Apr. 25, 1894.
William B. Hawes	Yarn Broker . . . 108 Bedford St., P. O. Box 733,	Fall River, Mass.	Oct. 24, 1895.
Alfred Hawkesworth	Supt. Merchants' Cotton Co.	Montreal, P. Q.	Apr. 26, 1893.
Fred Hawkesworth	Asst. Supt. Merchants' Cotton Co.	Montreal, P. Q.	Sept. 22, 1896.
William Hayes	Agt. Barker Mill	Auburn, Me.	Apr. 30, 1879.
W. G. Henderson	Agt. Shetucket Co.	Norwich, Conn.	Apr. 29, 1896.
A. E. Henry,	Mfr. Partner in Solway Mills,	Westerly, R. I.	Apr. 25, 1901.
T. I. Hickman,	Pres. and Treas. Graniteville Mfg. Co.	Augusta, Ga.	Apr. 25, 1901.

William R. Hill . . . Treas. Glasgow Manufg. Co. . . . . South Hadley Falls, Mass. Oct. 25, 1893.
George H. Hills . . . Treas. Davol Mills & Stevens Mfg. Co. . Fall River. Mass. . Oct. 24, 1895.
Charles H. Hobbs . . Agt. Thorndike Co. . . . . Thorndike, Mass. . . Apr. 28, 1886.
Franklin W. Hobbs . . Asst. Treas. Arlington Mills . . . . . P. O. Box 3590, 78 Chauncy St., Boston, Mass. . . . Apr. 27, 1899.
Louis L. Hohn . . . . . 122 High St., Westerly, R. I. . . . Apr. 28, 1897.
Charles M. Holmes . . Supt. Manchaug Co. . . . . Manchaug, Mass. . . Apr. 27, 1899.
Gideon F. Holmes . . Treas. and Gen. Mgr. Plymouth Cor- . . . . . dage Co. . . . . No. Plymouth, Mass. . Oct. 30, 1889.
George W. Holt . . . Agt. Monohansett Manufg. Co. . . Putnam, Conn. . . . Oct. 29, 1879.
Walter L. Holt . . . . Pres. Holt-Morgan Mills . . . . . Fayetteville, N. C. . . Oct. 18, 1900.
William P. Holt . . . Supt. Barnaby Mills . . . . . Fall River, Mass. . . Oct. 25, 1893.
Thomas Horsfield . . . . . 95 Bonney St., New Bedford, Mass. . Oct. 27, 1897.
Henry S. Houghton, Jr. Supt. Paul Whitin Manufg. Co. . . Northbridge, Mass. . Apr. 24, 1895.
W. C. Houston . . . . Pres. Hope Mills Manufg. Co. . . . . 333 Drexel Building, Philadelphia, Pa. . . Apr. 28, 1897.
Elisha H. Howard . . Treas. Harris Textile Co. . . . . 309 Butler Exchange, Providence, R. I. . . Apr. 25, 1883.
Henry S. Howe . . . . Dry Goods Commission, 68 Chauncy St., Boston, Mass. . Oct. 31, 1877.
Albert C. Hoy . . . . Asst. Supt. Hamlet Mills . . . . . Woonsocket, R. I. . . Apr. 28, 1898.
Charles W. Hubbard . Treas. Ludlow Mfg. Co., ... 133 Essex St., Boston, Mass. . . . Apr. 25, 1901.
W. S. Hume . . . . . Supt. Dominion Cotton Mills, Ltd. . . . . 176 Notre Dame St., Hochelaga, P. Q., Can. Oct. 29, 1890.
Otis L. Humphrey, . . Cotton Dept. Lowell Textile School, Lowell, Mass. . . . Apr. 25, 1901.
A. W. Hunking . . . . . 374 Stevens St., Lowell, Mass. . . . Apr. 24, 1895.
George A. Hurd, . . . Supt. Cocheco Mfg. Co. . . . . Dover, N. H. . . . . Apr. 25, 1901.

D. Edwin Irving . . . Treas. The Irving & Leiper Mfg. Co., Chester, Pa. . . . . Oct. 27, 1897.

J. E. Jenckes . . . . . Treas. E. Jenckes Manufg. Co. . . Pawtucket, R. I. . . Apr. 24, 1895.
Edward B. Jennings . . Treas. Samoset Co. . . . . Valley Falls, R. I. . . Sept. 29, 1898.
David L. Jewell . . . Agt. China, Webster & Pembroke Mills . Suncook, N. H. . Apr. 20, 1865.
David S. Johnston . . Treas. Cohoes Iron Foundry & Mach. Co., Cohoes, N. Y. . Oct. 28, 1891.
W. T. Jordan . . . . Mgr. Mountain Island Mfg. Co. . . Mountain Island, N. C. Oct. 24, 1895.

Frank E. Kaley . . . . Treas. Morse & Kaley Mfg. Co. . . Milford, N. H. . . . Oct. 24, 1895.
W. E. Keach . . . . . Supt. Grant Yarn Co. . 123 Myrtle Ave., Fitchburg, Mass. Oct. 26, 1892.
Roland R. Kelly . . . Supt. Williamstown Manufg. Co. . Williamstown Sta., Mass. Nov. 30, 1881.
George E. Kent . . . . Treas. Exeter Manufg. Co. & Prop. Pittsfield Mills . . . . . Pittsfield, N. H. . . Oct. 31, 1888.
Hervey Kent . . . . . Pres. Exeter Manufg. Co. . . . . Exeter, N. H. . . . Apr. 20, 1865.
Nathaniel B. Kerr . . . Agt. Boott Cotton Mills . . . . . Lowell, Mass. . . . Oct. 26, 1892.

John Kilburn . . . . . Belmont, Mass. . . . Apr. 20, 1865.
Harry W. Kimball . . . . . Bath, Me., ... Oct. 24, 1895.
Benjamin B. Kirk . . . Supt. Fall River Iron Works Co. . . Fall River, Mass. . . Apr. 28, 1897.
Albert Knight . . . . Supt. Quidnick Mills . . . . . Quidnick, R. I. . . . Apr. 24, 1895.
Albert F. Knight . . . . . 39 Main St., Woonsocket, R. I. . . Oct. 27, 1886.
C. Prescott Knight . . B. B. & R. Knight's Mills . . . . River Point, R. I. . . Sept. 29, 1898.
Jesse A. Knight . . . . Sec'y & Supt. Lawton Spinning Co. Providence, R. I. . . Oct. 26, 1892.
Stephen A. Knight . . Pres. and Agt. Hebron Manufg. Co. . . . . Box 820, Providence, R. I. . . Oct. 21, 1868.
Walter B. Knight . . . Reynolds Manufg. Co. . . . . Davisville, R. I. . . Apr. 24, 1889.
Webster Knight . . . B. B. & R. Knight's Mills . . . . . 3 Washington Row, Providence, R. I. . . Sept. 29, 1898.

Fred Lacey . . . . . Mgr. Montreal Cotton Co. . . Valleyfield, P. Q. . . . . Apr. 24, 1895.
William T. Lang . . . Agt. Brookside Mills . . . . . Knoxville, Tenn. . . Apr. 28, 1897.
Walter H. Langshaw . Agt. Dartmouth Manufg. Corp. . . New Bedford, Mass. . Apr. 29, 1896.
Elliott Cowdin Lambert Supt. Amoskeag Manufg. Co. . . . Manchester, N. H. . Oct. 24, 1895.
George H. Law . . . Supt. Merchants' Mfg. Co. . . . . 815 Walnut St., Fall River, Mass. . . Apr. 28, 1897.
Harold Lawton . . . . Gen. Mgr. Baltic Mills Co. . . . . Baltic, Conn. . . . . Oct. 27, 1886.
John Edward Lawton . Governing Director American Thread Co. . . . . Matlock, Derbyshire, England . Apr. 25, 1901.
Evan Arthur Leigh . . Textile Machinery . . 70 Kilby St., Boston, Mass. . . . Oct. 29, 1890.
John Leiper . . . . . Supt. Fitchburg Worsted Mills, Upland Road . . . . . 171 Blossom St., Fitchburg, Mass. . . Oct. 27, 1897.
J. Colby Lewis . . . . Supt. & Mgr. Vesta Cotton Mills, . . Charleston, S. C. . . Oct. 26, 1892.
Leontine Lincoln . . . Pres. Seaconnet Mills . . . . . Fall River, Mass. . . Apr. 28, 1897.
B. F. G. Linnell . . . Commission Merchant, Yarns, Threads and Twines . . . . . P. O. Box 645, Central Falls, R. I. . . Oct. 27, 1897.
Charles Warren Lippitt, Treas. Silver Spring B. & D. Co. . . Providence, R. I. . . Oct. 30, 1878.
Henry F. Lippitt . . . Agt. Social and Manville Cos. . . . Providence, R. I. . . Apr. 27, 1881.
William H. Loftus . . Supt. Clark Thread Co. . . . . Newark, N. J. . . . Oct. 27, 1897.
Robert W. Lord . . . Agt. R. W. Lord & Co. . . . . Kennebunk, Me. . . Oct. 20, 1869.
Ernest Lovering . . . Agt. Lyman Mills . . . . . Holyoke, Mass. . . . Apr. 25, 1888.
Henry M. Lovering . . Agt. Whittenton Manufg. Co. . . . Taunton, Mass. . . . Oct. 27, 1880.
William C. Lovering . Pres. Whittenton Mfg. Co., . . 40 Water St., Boston, Mass. Oct. 25, 1876.
William M. Lovering . Supt. Whittenton Manufg. Co. . . . Taunton, Mass. . . . Sept. 27, 1894.
Arthur H. Lowe . . . Treas. Parkhill Manufg. Co. . . . . Fitchburg, Mass. . . Oct. 30, 1889.
David Lowe . . . . . Asst. Supt. Parkhill Manufg. Co. . . Fitchburg, Mass. . . Apr. 24, 1895.
A. Lawrence Lowell . Trustee, Lowell School of Design, ... 843 Exchange Bldg., Boston, Mass. . . . Apr. 25, 1901.
Dudley T. Lyall . . . Asst. Mgr. Brighton Mills . . . . . Passaic, N. J. . . . . Sept. 22, 1896.
William L. Lyall . . . Supt. J. & W. Lyall Loom and Machine Works and Sec. . . . . Brighton Mills . . . . . Passaic, N. J. . . . . Oct. 26, 1892.
Herbert Lyman . . . . . Box 1717, Boston, Mass. . . . Oct. 24, 1895.
Otis G. Lynch . . . . Supt. Enterprise Manufg. Co. . . . Augusta, Ga. . . . . Oct. 24, 1895.
Alvin S. Lyon . . . . Supt. Bigelow Co. . . . . Lowell, Mass. . . . Apr. 26, 1882.

James R. MacColl	Treas. Lorraine Manufg. Co.	Pawtucket, R. I.	Apr. 24, 1895.
Charles L. Macomber	Pres. Winthrop Cotton Yarn Co.	Taunton, Mass.	Apr. 24, 1895.
Frederick B. Macy,	Treas. Soule Mills,	New Bedford, Mass.	Apr. 25, 1901.
Amos G. Maddox	Supt. Linwood Mill	Linwood, Mass.	Oct. 18, 1900.
Charles T. Main	Mech. and Mill Engineer Dean & Main	53 State St., 1112 Exchange Bldg., Boston, Mass.	Oct. 28, 1885.
Charles R. Makepeace	Mill Engineer	Box 973, Providence, R. I.	Apr. 30, 1890.
A. T. Malcolmson	Selling Agt. C. Bischoff & Co.	19 George St., Box 1104, Providence, R. I.	Oct. 27, 1897.
Arthur B. Mann	J. H. Martin & Co., Box 465, 99 Franklin St., New York		Apr. 25, 1894.
Charles H. Manning	Supt. Amoskeag Manufg. Co.	Manchester, N. H.	Oct. 28, 1885.
Henry F. Mansfield	Gen. Supt. Utica Steam Cotton Mills and Mohawk Valley Cotton Mills	Utica, N. Y.	Apr. 30, 1890.
Paul J. Marrs	Treas. Henderson Cotton Mills	Henderson, Ky.	Oct. 27, 1897.
Albert G. Martin	Supt. Kincaid Manufg. Co.	Box 182, Griffin, Spalding County, Ga.	Apr. 30, 1884.
Henry D. Martin		Shirley, Mass.	Apr. 28, 1897.
John R. Mason	Supt. Harmony Mills 237 Main St.,	Cohoes, N. Y.	Apr. 28, 1897.
Philip A. Mathewson	Supt. King Philip Mills	Box 607, Fall River, Mass.	Apr. 24, 1895.
Thomas Mayor	Textile Machinery	Thomas Mayor & Son, 26 Olney St., Providence, R. I.	Oct. 27, 1880.
Robert McArthur	Agt. Pepperell Mfg. Co.	Biddeford, Me.	Apr. 17, 1872.
Thos. McAuliffe	Supt. Stevens Mfg Co.	Fall River, Mass.	Apr. 28, 1898.
Charles D. McDuffie	Agt. Manchester Mills	Manchester, N. H.	Apr. 21, 1869.
Fred C. McDuffie	Treas. Everett Mills and York Manufg. Co.	P. O. Box 2934, 40 Water St., Boston, Mass.	Oct. 25, 1882.
William G. McLoon	Supt. Lancaster Mills,	Clinton, Mass.	Apr. 27, 1892.
William P. McMullan	Agt. Naumkeag Steam Cotton Co.	Salem, Mass.	Sept. 27, 1894.
John Tempest Meats	Agt. Mason Machine Works	Taunton, Mass.	Apr. 27, 1887.
Henry P. Meikleham,	Agt. Mass. Mills in Georgia	Lindale, Floyd Co., Ga.	Apr. 26, 1900.
Charles H. Merriman, Jr.	Social Mfg. Co.	Providence, R. I.	Apr. 24, 1895.
Frank M. Messenger	Agt. Grosvenor Dale Co.	No. Grosvenor Dale, Conn.	Apr. 27, 1887.
W. H. Miles	Agt. Farwell Mills	Lisbon, Me.	Sept. 22, 1896.
R. M. Miller, Jr.	Pres. & Treas. Elizabeth Mills	Charlotte, N. C.	Sept. 29, 1898.
James I. Milliken	Agt. Everett Mills	Lawrence, Mass.	Oct. 26, 1892.
Roscoe S. Milliken	Supt. Nashua Mfg. Co.	Nashua, N. H.	Apr. 29, 1896.
David Milne	C. J. Milne & Sons	Washington Ave. & 11th St., Philadelphia, Pa.	Apr. 28, 1897.
A. B. Mole	Mgr. Greylock Mill	Adams, Mass.	Apr. 24, 1895.
Edward A. Mongeon	Supt. Lonsdale Cos. Mills	Lonsdale, R. I.	Apr. 24, 1895.
J. R. Montgomery	Pres. The J. R. Montgomery Co.	Windsor Locks, Conn.	Sept. 29, 1898.
George A. Moody	Supt. West Warren Cotton Mills	West Warren, Mass.	Apr. 27, 1899.
James Sumter Moore	Sec. and Treas. Olympia & Richland Cotton Mills	Columbia, S. C.	Apr. 26, 1900.
Fred W. Moore	Agt. Cordis Mills	P. O. Box 582, Millbury, Mass.	Apr. 27, 1892.
Albert H. Morton	Supt. Kitson Machine Co.	Lowell, Mass.	Oct. 28, 1891.
Oliver H. Moulton	Supt. Hamilton Manufg. Co.	Lowell, Mass.	Apr. 20, 1865.
Farquharson J. Muir	Supt. Canadian Col'd Cot. Mills Co., Ltd., St. Croix Mill	Milltown, N. B., Can.	Apr. 27, 1892.

John Neild	Supt. Wamsutta Mills Nos. 4-5, 8 Franklin St.	New Bedford, Mass.	Apr. 25, 1901.
Roscius C. Newell	Supt. Palmer Mill	Three Rivers, Mass.	Oct. 24, 1895.
William G. Nichols	Sec. and Treas. Springstein Mills	Chester, S. C.	Oct. 25, 1893.
William M. Nixon	Pres. Atlanta Woolen Mills	Atlanta, Ga.	Oct. 5, 1899.
Franklin Nourse	Agt. Lawrence Manufg. Co.	Lowell, Mass.	Apr. 24, 1878.

S. Odenheimer	Treas. Lane Mills	New Orleans, La.	Oct. 25, 1893.
Charles K. Oliver	Treas. Mt. Vernon-Woodberry Cotton Duck Co. 346-8 Equitable Bldg.	Baltimore, Md.	Sept. 27, 1894.
J. Edward Osborn	Treas. American Linen Co.	Fall River, Mass.	Apr. 28, 1897.
Henry Osgood,	Supt. Wm. A. Slater Mills Corp.,	Jewett City, Conn.	Apr. 25, 1901.
Herbert W. Owen	Asst. Supt. Merchants' Mfg. Co.	Fall River, Mass.	Oct. 5, 1899.
Oscar L. Owen	Mech. and Mill Eng. Whitin Machine Works	Whitinsville, Mass.	Apr. 25, 1894.

Elmer E. Page	Agt. York Manufg. Co.	Saco, Me.	Apr. 27, 1892.
Francis J. Parker	Treas. Monadnock Mills, 81 Milk St.	Boston, Mass.	Jan. 15, 1868.
O. B. Parker		Central Falls, R. I.	Apr. 24, 1895.
Samuel L. Parker	Supt. Turners Falls Cotton Mills Box 627,	Turners Falls, Mass.	Apr. 29, 1896.
Walter E. Parker	Agt. Pacific Mills, 217 Haverhill St.,	Lawrence, Mass.	Apr. 25, 1877.
John H. Parks	Pres. Wm. Parks & Son, Ltd.	St. John, N. B.	Apr. 24, 1878.
Duncan D. Parmly	Treas. Johnson Mfg. Co. and Dunbar Mills Co. 49 Wall St.,	New York, N. Y.	Sept. 22, 1896.
Samuel F. Patterson	Pres. and Treas. Thistle Mills Co.	Ilchester, Md.	Oct. 18, 1900.
John W. Pead	Agt. Merrimack Manufg. Co. Box 1231,	Lowell, Mass.	Apr. 26, 1893.
James R. Pearce	Supt. Fulton Bag and Cotton Mills	Atlanta, Ga.	Oct. 24, 1895.
William C. Peirce	Treas. Elizabeth Mills, 564 Eddy St.,	Providence, R. I.	Apr. 24, 1895.
William D. Pennell	Agt. Hill Manufg. Co.	Lewiston, Me.	Apr. 16, 1873.
Haven C. Perham	Treas. Kitson Machine Co.	Lowell, Mass.	Apr. 30, 1879.
Henry C. Phillips	Supt. Greylock Mills,	North Adams, Mass.	Apr. 25, 1894.
Benjamin Phipps	Treas. Union Mfg. Co., 4 Winthrop Sq.	Boston, Mass.	Sept. 29, 1898.
Albert R. Pierce	Supt. Pierce Mfg. Corp.	New Bedford, Mass.	Oct. 5, 1899.
Andrew G. Pierce, Jr.	Treas. Rotch Spinning Co. Treas. Pierce Manufg. Corp. Treas. Howland Mills Corp.	P. O. Box, 34, New Bedford, Mass.	Apr. 24, 1895.
Reuben Pilling, Jr.	30 Hudson St.,	Providence, R. I.	Apr. 29, 1896.
Charles H. Plummer	Agt. Great Falls Manufg. Co.	Somersworth, N. H.	Apr. 25, 1888.
Charles T. Plunkett	Sec. Berkshire Cotton Mfg. Co.	Adams, Mass.	Apr. 28, 1897.
Charles H. Potter,	Supt. Montreal Cotton Co.,	Valleyfield, P. Q.,	Apr. 25, 1901.

Joseph H. Potter, Jr. . Supt. Durfee Mills . . . . . Fall River, Mass. . . Apr. 27, 1899.
J. F. Powers . . . . . Supt. Eagle Mill . . . . . North Adams, Mass. Oct. 5, 1899.
Herbert L. Pratt . . . Agt. Bates Manufg. Co. . . . . Lewiston, Me. . . . Oct. 27, 1875.
T. W. Pratt . . . . . Pres. West Huntsville Cotton Mill Co. . . . . Huntsville, Ala. . . . Sept. 22, 1896.
John E. Prest . . . . Gen. Supt. Harmony Mills . . . . Cohoes, N. Y. . . . Apr. 17, 1872.

M. W. Quinn . . . . . Agt. Hamilton Woolen Co. . . . . Amesbury, Mass. . . Oct. 27, 1886.

T. G. Ramsdell . . . . Agt. Monument Mills . . . . . Housatonic, Mass. . . Oct. 30, 1878.
Emory S. Rathbun . . Supt. Pequot Mills . . . . . Montville, Conn. . . Apr. 27, 1899.
M. A. Rawlinson . . . Supt. Tremont and Suffolk Mills . . Lowell, Mass. . . . Apr. 24, 1895.
John F. Reardon . . . Agt. Falls Co. . . . . Norwich, Conn. . . . Apr. 26, 1900.
Robert Redford . . . Mfr. . . . . Box 28, Lawrence, Mass. . . Apr. 26, 1882.
R. S. Reinhardt . . . . Treas. and Mgr. Elm Grove Cotton Mills Lincolnton, N. C. Apr. 28, 1898.
L. B. Renfrew . . . . Treas. Renfrew Mfg. Co. . . . . Adams, Mass. . . . Oct. 5, 1899.
T. H. Rennie . . . . . Supt. Graniteville Mfg. Co. . . . . Graniteville, S. C. . . Oct. 18, 1900.
Frederick W. Reynolds, Supt. Potomska Mills, ... Box 299, ... 20 Fifth St., New Bedford, Mass. . Apr. 26, 1900.
F. H. Rice . . . . . care Henry F. Harris, 340 Main St., Worcester, Mass. . . Apr. 28, 1880.
Charles H. Richardson Agt. Lancaster Mills . . . . . Clinton, Mass. . . . Apr. 24, 1889.
W. H. Richmond . . . Supt. Bibb Mill No. 2 . . . . . Macon, Ga. . . . . Oct. 27, 1897.
Walter Rigby . . . . Supt. Ballou Yarn Converting Co. . . . . 189 Charles St., Providence, R. I. . . Apr. 26, 1900.
Charles E. Riley . . . Textile Machinery . . . . . Box 2815 . . . . . 281 Congress St., Boston, Mass. . . . Apr. 25, 1888.
William H. Ritter . . . Gen. Supt. Johnson & Johnson . . . . . 266 George St., New Brunswick, N. J. Apr. 26, 1900.
George W. Robbins . . Supt. Dyerville Mfg. Co., ... 610 Manton Ave., Providence, R. I. . . Apr. 28, 1897.
Benj. H. Roberts . . . General Mill Supplies 163 Grove St., Fall River, Mass. . . Apr. 26, 1900.
Charles D. Robinson . Supt. Crompton Co. . . . . Crompton, R. I. . . . Sept. 27, 1894.
Edwin A. Robinson . . Asst. Supt. Tremont and Suffolk Mills Lowell, Mass. . . . . Oct. 18, 1900.
William A. Robinson . Asst. Supt. Social Manufg. Co. . . . Woonsocket, R. I. . Apr. 29, 1896.
W. H. Rose . . . . . Sec'y & Treas. Granby Cotton Mills, Columbia, S. C. . . . Oct. 18, 1900.
John R. Rostron . . . Lancaster Mills . . . . . Clinton, Mass. . . . Sept. 29, 1898.
John K. Russell . . . . . Vineland, N. J. . . . Apr. 29, 1891.

Edward H. Sanborn . . Vice Pres. Cold Spring Bleaching and Finishing Works . . . . . Real Estate Trust Bldg., Philadelphia, Pa. . . Oct. 18, 1900.
Arnold B. Sanford . Pres. and Mgr. American Cotton Yarn Exchange . . . . . 67 Chauncy St., Boston, Mass. . . . Oct. 25, 1882.

J. Herbert Sawyer	Care H. B. Sawyer, 93 Federal St., Boston, Mass.	July	19, 1865.
F. C. Sayles	Pres. Baltic Mill . . . . . Pawtucket, R. I.	Act.	27, 1897.
George H. Sayward	. . . . . Winchester, Mass.	Oct.	29, 1890.
Arnold Schaer	Agt. Warren Manufg. Co. . . . . Warren, R. I.	Apr.	24, 1895.
Theodore C. Search	Pres. Cold Spring Bleaching and Finishing Works . . . . . 32 South Broad St., Philadelphia, Pa.	Oct.	18, 1900.
Charles M. Sears	West Point Mfg. Co. . . . . Langdale, Ala.	Apr.	28, 1898.
George H. Shapley	Treas. Silver Lake Co., 78 Chauncy St., Boston, Mass.	Apr.	29, 1896.
Frank P. Sheldon	Mill Engineer . . . . . Industrial Trust Bldg. Providence, R. I.	Apr.	25, 1894.
Thomas C. Sheldon	Agt. Fitchburg Duck Mills . . . . . 8 School St., Fitchburg, Mass.	Oct.	29, 1884.
Willis S. Shepard	Pres. American Net and Twine Co. Canton, Mass.	Apr.	29, 1896.
William F. Sherman	Mill Engineer . . . . . 107 New Brazer Bldg., 27 State St., Boston, Mass.	Apr.	15, 1874.
Charles M. Shove	Treas. Granite Mills . . . Box 45, Fall River, Mass.	Oct.	27, 1875.
Herbert H. Shumway	Treas. and Agt. Corr Manufg. Co. Taunton, Mass.	Apr.	26, 1893.
Francis H. Silsbee	Supt. Cotton Dept. Pacific Mills Lawrence, Mass.	Apr.	27, 1887.
Nathaniel G. Simonds	Treas. Naumkeag Steam Cotton Co., Salem, Mass.	Apr.	28, 1898.
Louis Simpson	. . . . . Victoria Chambers, Ottawa, Ont.	Apr.	24, 1895.
Abbott E. Slade	Treas. Laurel Lake Mills . . . . . 863 High St., Fall River, Mass.	Oct.	25, 1893.
Arthur T. Smith	Supt. Langley Manufg Co. . . . / Supt. Aiken Manufg. Co. . . . . Langley, S. C.	Oct.	24, 1895.
Joel Smith	Supt. The J. P. King Manufg. Co. Augusta, Ga.	Oct.	24, 1895.
J. C. Smith	Supt. Chace Mills . . . . . Fall River, Mass.	Oct.	27, 1897.
James Herbert Smith	Supt. Quinebaug Co. . . . . Danielson, Conn.	Apr.	28, 1898.
Thomas Henry Smith	Jamestown Cotton Mill . . . . . Jamestown, N. Y.	Apr.	26, 1900.
Ellison A. Smyth	Pres. Pelzer Manufg. Co. . . . . Pelzer, S. C.	Oct.	26, 1892.
William S. Southworth	Agt. Mass. Cotton Mills . Box 1230, Lowell, Mass.	Oct.	31, 1888.
S. S. Spencer	Supt. Conestogo Steam Mills . . . Lancaster, Pa.	Oct.	25, 1876.
Wilton H. Spencer	Textile Manuf., . . 7 Exchange Pl., Providence, R. I.	Apr.	28, 1898.
George E. Spofford	Supt. Blackstone Mfg. Co. . . . . Blackstone, Mass.	Apr.	29, 1896.
Henry B. Sprague	Treas. Boston Woven Hose and Rubber Co. . . . . Cambridgeport, Mass.	Oct.	5, 1899.
Leroy Springs	Pres. Lancaster Cotton Mills . . . Lancaster, S. C.	Oct.	24, 1895.
George R. Stearns	Pres. Riverside Mills . . . . . Augusta, Ga.	Apr.	30, 1890.
T. B. Stevenson	Supt. Readville Cotton Mill . . . . Hyde Park, Mass.	Apr.	26, 1900.
Robert Stewart	Supt. Ashton Mills . . . . . Ashton, R. I.	Apr.	27, 1899.
Walter F. Stiles	Treas. Orswell Mills . . . . . Fitchburg, Mass.	Oct.	24, 1895.
O. W. Stites	Mgr. Commonwealth Cotton Mfg. Co. Durham, N. C.	Oct.	24, 1895.
Herman F. Straw	Agt. Amoskeag Manufg. Co. . . . Manchester, N. H.	Oct.	28, 1885.
John Sullivan	Supt. Union Cotton Mfg. Co. . . . Fall River, Mass.	Apr.	27, 1899.
Timothy Sullivan	Supt. Davol Mills . . . . . Fall River, Mass.	Apr.	27, 1899.
Walter H. Summersby	Supt. Pontiac Mill and Bleachery Pontiac, R. I.	Oct.	25, 1893.
D. G. Sunderland	Treas. The Pelham Mills . . . . . Pelham, S. C.	Oct.	18, 1900.
James O. Sweet	Agt. and Treas. Ashland Cotton Co. Jewett City, Conn.	Apr.	28, 1886.

Robert Rennie Taft . . . . . P. O. Box 1443, Providence, R. I. . . . Apr. 24, 1895.
Robert W. Taft . . . . Treas. Coventry Co. . . Box 1144, Providence, R. I. . . . Sept. 27, 1894.
George P. Taylor . . . Treas. Danielsonville Cotton Co. of Danielson, Conn. . . .
. . . . . Clinton, Mass. . . . Oct. 27, 1880.
James W. Taylor . . . Agt. and Supt. Canoe River Mills . . . . . .
. . . . . Box 46, Taunton, Mass. . . . Oct. 26, 1892.
W. Marshall Taylor . . . . . 34 Arlington St., Holyoke, Mass. . . . Sept. 22, 1896.
Richard Thackeray . . Supt. Weetamoe Mills . . . . . Fall River, Mass. . . . Apr. 29, 1885.
Earl A. Thissell . . . . Gen. Mgr. Woonsocket Bobbin Co. Woonsocket, R. I. . . Oct. 30, 1878.
Ariel C. Thomas . . . Agt. Saratoga Victory Mfg. Co. . . . . .
. . . . . Victory Mills, Saratoga Co., N. Y. . . Oct. 31, 1888.
Charles E. Thomas . . Treas. Forestdale Manufg. Co. . . . . .
. . . . . 44 Prospect St., Woonsocket, R. I. . . Oct. 31, 1883.
Edward W. Thomas . . Agt. Tremont and Suffolk Mills . . . . . .
. . . . . 166 Pawtucket St., Lowell, Mass. . . . Apr. 30, 1884.
Ralph E. Thomson . . Supt. Parkhill Manufg. Co., Mill C. Fitchburg, Mass. . . Apr. 25, 1894.
D. M. Thompson . . . Gen. Mgr. B. B. and R. Knight's Mills . . . . . .
. . . . . Box 1442, Providence, R. I. . . Oct. 28, 1885.
James O. Thompson, Jr. Supt. Wamsutta Mills . . . . . New Bedford, Mass. . Oct. 18, 1900.
Joseph S. Tidd . . . . Treas. and Agt. Oakland Mills . . . Taunton, Mass. . . . Apr. 27, 1899.
Horace W. Tinkham . Treas. and Agt. Robeson Mills . . . Fall River, Mass. . . Apr. 27, 1899.
W. O. Todd . . . . . Sec. and Treas. Lawton Spinning Co. Box 1125, ...
. . . . . 621 Banigan Building, Providence, R. I. . . Oct. 18, 1900.
James P. Tolman . . . Pres. Samson Cordage Works . . . . . .
. . . . . 115 Congress St., Boston, Mass. . . . Oct. 29, 1890.
D. A. Tompkins . . . Engineer and Contractor The D. A. Tompkins Co. . . .
. . . . . Charlotte, N. C. . . . Oct. 24, 1895.
George W. Towne . . . Mgr. Columbus Power Co. . . . . Columbus, Ga. . . . Oct. 26, 1892.
Edward B. Townsend, . Treas. Warwick Mills, ...
. . . . . 53 State St., Room 632, Boston, Mass. . . . Apr. 25, 1901.
Robert B. Treat . . . . Prop. Centerville Cotton Mills . . . Centerville, R. I. . . Sept. 27, 1894.
C. H. Truesdell . . . . Supt. Attawaugan Mill & Ballou Mill, Killingly, Conn. . . Oct. 29, 1884.
Edmund E. Truesdell . Supt. China, Webster & Pembroke Mills . Suncook, N. H. . Apr. 26, 1876.
Oscar B. Truesdell . . . . . 18 Washington Terrace, Newtonville, Mass. . Oct. 15, 1873.
George E. Tucker . . . Agt. Otis Co. . . . . Ware, Mass. . . . . Oct. 24, 1895.
Philip S. Tuley . . . Pres. and Treas. Louisville Cotton Mills Co. . . . . .
. . . . . 1008 Goss Ave., Louisville, Ky. . . . Oct. 18, 1900.
Charles D. Turnbull . . Treas. Wm. A. Slater Mills Corp. . . P. O. Box 5324, . . .
. . . . . 89 State St., Boston Mass. . . . . Oct. 27, 1897.
George W. Turner . . Supt. Argo Mills Co. . . . . Gloucester, N. J. . . Apr. 26, 1900.
William D. Twiss . . . Supt. Everett Mills . . . . . Lawrence, Mass. . . April 29, 1896.

Charles T. Upton . . . . . 63 Mt. Vernon St., Lowell, Mass. . . . Apr. 28, 1897.

George A. Vaughan . . Supt. The Putnam Manufg. Co. . . Putnam, Conn. . . . Sept. 22, 1896.
William P. Vaughan . Agt. Putnam Manufacturing Co. . . . . .

		Banigan Building, Providence, R. I.	Sept. 29, 1898.
Eugene F. Verdery	Pres. and Treas. Warren Mfg. Co.	Augusta, Ga.	Apr. 26, 1900.
James P. Verdery	Pres. Enterprise Mfg. Co.	Augusta, Ga.	Apr. 26, 1900.
Frank P. Vogl	Agt. Monadnock Mills	Claremont, N. H.	Sept. 27, 1894.
Jude C. Wadleigh	Supt. Mass. Cotton Mills	Lowell, Mass.	Oct. 26, 1892.
Herbert E. Walmsley	Agt. Wamsutta Mills	New Bedford, Mass.	Oct. 29, 1890.
Robinson Walmsley	Supt. Tecumseh Mills, P. O. Box 246,	Fall River, Mass.	Apr. 27, 1899.
Frederick T. Walsh	Agt. Thomas Leyland & Co.	53 India St., Boston, Mass.	Apr. 28, 1897.
James A. Walsh	Agt. Lewiston Bleachery and Dye Works	Lewiston, Me.	Apr. 27, 1892.
Joseph Watters	Supt. Osborn Mills	Fall River, Mass.	Apr. 26, 1900.
F. E. Wattles	Agt. Boscawen Mills	Penacook, N. H.	Oct. 5, 1899.
Joseph W. Wattles	Manufacturers' Supplies	Canton Junction, Mass.	July 18, 1866.
George W. Weeks		Clinton, Mass.	Apr. 21, 1869.
W. B. Smith Whaley	Mechanical & Mill Engineer Pres. Richland Cotton Mills Granby Cotton Mills,	1328 Main St., Columbia, S. C.	Apr. 24, 1895.
H. D. Wheat	Pres. and Treas. Gaffney Mfg. Co. Pres. and Treas. Alpha Mills, Charlotte, N. C.	Gaffney, S. C.	Apr. 24, 1895.
Channing Whitaker	Infringement and Patentability of Inventions Lowell Machine Shop	Lowell, Mass.	Oct. 15, 1873.
A. Tenny White	Supt. Manville Co.	Manville, R. I.	Oct. 26, 1887.
Charles D. White	Agt. Uncasville Mfg. Co.	Norwich, Conn.	Oct. 27, 1897.
Arthur F. Whitin	Pres. Saunders Cotton Mills	Whitinsville, Mass.	Apr. 24, 1895.
Fred B. Whitin	Agt. Uxbridge Cotton Mills	Linwood, Mass.	Apr. 28, 1897.
Henry T. Whitin	Treas Paul Whitin Manufg. Co.	Northbridge, Mass.	Apr. 25, 1877.
Alfred N. Whiting	Sec. and Treas. L. M. Harris Manufg. Co. 167 Pleasant St.,	Worcester, Mass.	Apr. 21, 1875.
William Whitman	Treas. Arlington Mills, 78 Chauncy St.,	P. O. Box 3590, Boston, Mass.	Apr. 25, 1901.
William S. Whitney	Supervising Engineer, American Woolen Co.	Lawrence, Mass.	Apr. 24, 1878.
Arthur Whittam	Director Textile Dept., Mississippi Agricultural and Mechanical College,	Agricultural College, Miss.,	Apr. 28, 1898.
William Whittam, Jr.	Mgr. Lawton Spinning Co.	Woonsocket, R. I.	Apr. 26, 1893.
George F. Whitten	Agt. Amory Mfg. Co.	Manchester, N. H.	Oct. 26, 1892.
John H. Whitten	Supt. Stark Mills	Manchester, N. H.	Apr. 28, 1898.
W. R. B. Whittier	Mgr. Whittier Mills	Chattahoochee, Fulton Co., Ga.	Oct. 18, 1900.
Nelson Whittier	Treas. Whittier Mills	Lowell, Mass.	Oct. 18, 1900.
Edward B. Wilbur	Supt. Gaffney Mfg. Co.	Gaffney, S. C.	Oct. 30, 1889.
Benjamin Wilcox	Treas. City and Bristol Mfg. Co.	New Bedford, Mass.	Apr. 26, 1900.
Henry M. Wilcox	Treas. John Rhodes Warp Co.	Millbury, Mass.	Apr. 24, 1889.
John B. Wild	Pres. Oneita Knitting Mills	Utica, N. Y.	Apr. 26, 1900.

Eben C. Willey . . . . Agt. Atlantic Cotton Mills . . . . . Lawrence, Mass. . . Apr. 29, 1896.
Franklin D. Williams . Treas. Fiskdale Mills, ... 87 Milk St., Room 21, Boston, Mass. . . . . Apr. 25, 1901.
Broadus E. Willingham, Sec. and Treas. Willingham Cotton Mills . . . . . Macon, Ga. . . . . Oct. 18, 1900.
Theop. W. Wilmarth . Supt. Lynchburg Cotton Mill Co. . . . . 1205 Floyd St., Lynchburg, Va. . . . Oct. 31, 1883.
Thomas Wilmarth . . . Supt. Saunders Cotton Mills . . . . Saundersville, Mass. . Apr. 21, 1875.
J. P. Wilson . . . . . Treas. Dover Yarn Mills . . . . . Charlotte, N. C. . . . Oct. 24, 1895.
George Wood . . . . Pres. and Treas. Millville Manufg. Co. . . . . 626 Chestnut St., Phila., Pa. . . . . Oct. 16, 1872.
John P. Wood . . . . . Spring Garden and 22d Sts., Philadelphia, Pa. . . Apr. 28, 1897.
Oscar W. Wood . . . Treas. Germantown Spinning Co. . . . . Germantown, Philadelphia, Pa. . . Oct. 18, 1900.
C. J. H. Woodbury . . Secretary and Treasurer . . . . . Lynn, Mass. . . . . Oct. 29, 1879.

Adelbert R. Young . . Supt. Ashland Cotton Co. . . . . Jewett City, Conn. . . Apr. 25, 1894.
James M. Young . . . Mgr. Hamilton Cotton Co. . . . . Hamilton, Ont., Can. Apr. 27, 1899.

ASSOCIATE MEMBERS.

S. B. Alexander, Jr. . . Pres. S. B. Alexander, Jr. Co. . . . Charlotte, N. C. . . . Oct. 18, 1900.
Eugene C. Andres . . Cotton Merchant . . . . . 577 John Hancock Building, Boston, Mass. . . . . Oct. 18, 1900.
H. B. Ashton . . . . Agt. S. A. Felton & Son Co. . . . . 153 Adams St., Medford, Mass. . . . Apr. 26, 1900.
Henry Ashworth . . . Agt. of Elijah Ashworth, Mfr. of Card Clothing . . . . . Box 427, Fall River, Mass. . . Apr. 28, 1897.

George R. Babbitt . . . Pres. and Gen. Mgr. American Oil Co. . . . . 182 So. Water St., Providence, R. I. . . Apr. 24, 1895.
D. C. Ball . . . . . Gen. Mgr. The American Cotton Co. . . . . 27 William St., New York, N. Y. . . Oct. 24, 1895.
Edwin Barnes . . . . Vice Pres. Wm. Firth Co. . . . . 67 Equitable Building, Boston, Mass. . . . . Apr. 26, 1900.
George S. Barnum . . Sec. and Treas. The Bigelow Co. . New Haven, Conn. . Apr. 24, 1895.
Colin C. Bell . . . . Pres. and Treas. Laminar Fibre Co. No. Cambridge, Mass. Apr. 29, 1896.
Frank P. Bennett . . . Publisher American Wool and Cotton Reporter . . . . . 530 Atlantic Ave., Boston, Mass. . . . Sept. 22, 1896.
William H. Bent . . . Treas. Mason Machine Works . . . Taunton, Mass. . . . April 29, 1896.
F. H. Bishop . . . . . Gen. Mgr. Universal Winding Co. . . . . 95 South St., Boston, Mass. . . . . Apr. 26, 1900.

Arthur T. Bradlee, . . Mgr. Cotton Yarn Dept., Harding, Whitman & Co. . . . .
. . . . . 78 Chauncy St., Boston, Mass. . . . . Apr. 25, 1901.
J. Payson Bradley . . . The Kehew-Bradley Co. . . . . .
. . . . . 24 Purchase St., Boston, Mass. . . . Apr. 24, 1895.
J. Frank Braids . . Mgr. Grease & Oil Dept., Charles S. Bush Co. . . . . .
. . . . . 212 Weybosset St., Providence, R. I. . . Apr. 28, 1897.
Henry G. Brinckerhoff . N. E. Mgr. Green Fuel Economizer Co., Box 2654 . . . .
. . . . . Room 1053, Exchange Bldg., 53 State St., Boston, Mass. Sept. 22, 1896.
D. Russell Brown . . . Pres. Brown Bros. Co. . . . . .
. . . . . 62 Exchange Place, Providence, R. I. . . Apr. 24, 1895.
H. Martin Brown . . . Treas. U. S. Bobbin & Shuttle Co. . Providence, R. I. . . Apr. 24, 1895.
Percy H. Brundage . . American Industrials Co. . . . . .
. . . . . 290 Broadway, New York, N. Y. . . Oct. 5, 1899.
John H. Burghardt . . Page Belting Co. . . . 31 Pearl St., Boston, Mass. . . . Apr. 24, 1895.
Eugene E. Burnham . . Belt Mfr. . . . . 252 Lowell St., Lawrence, Mass. . . Oct. 24, 1895.
Fred N. Bushnell . . . Mech. Supt. Narragansett Electric Light Co. . . . . .
. . . . . 3 South St., Providence, R. I. . . Sept. 29, 1898.
Harry W. Butterworth . Sec. H. W. Butterworth & Sons . . . . . .
. . . . . York and Cedar Sts., Philadelphia, Pa. . . Oct. 27, 1897.
James Butterworth . Pres. H. W. Butterworth & Sons Co. . . . . .
. . . . . York and Cedar Sts., Philadelphia, Pa. . . Apr. 24, 1895.

Albert L. Calder, 2nd . Cotton Broker . . . . . .
. . . . . 28 Market Square, Box 206, Providence, R. I. . . Apr. 26, 1900.
French Campbell . . . Commission Merchant, 75 Granite St., Manchester, N. H. . Oct. 27, 1897.
Malcolm Campbell . . Gen. Mgr. Woonsocket Machine and Press Co. . . . . .
. . . . . Woonsocket, R. I. . . Apr. 24, 1895.
W. W. Carey . . . . . Mfr. Wood Rim Pulleys and Wood Working Machinery . .
. . . . . 514 Broadway, Lowell, Mass. . . . . Apr. 24, 1895.
J. E. Cheesman . . . . Gen. Mgr. Cheesman Cotton Gin Co. . . . . .
. . . . . 27 William St., New York, N. Y. . . Oct. 5, 1899.
Charles H. Child . . . Treas. Standard Mill Supply Co. . . . . .
. . . . . P. O. Box 1406, 77 Exchange Place, Providence, R. I. . . Apr. 24, 1895.
Henry C. Clark . . . . Pres. Charlotte Supply Co. . . . . Charlotte, N. C. . . . Apr. 28, 1898.
C. C. Cowan . . . . . 372 Front St., Memphis, Tenn. . . Oct. 5, 1899.
Thomas G. Cox . . . . Selling Agt. Mason Machine Works . . . . . .
. . . . . Box 316, . Taunton, Mass. . . . Apr. 24, 1895.
George Crompton . . . . . Worcester, Mass. . . Oct. 27, 1897.
Randolph Crompton . . . . . Worcester, Mass. . . Oct. 27, 1897.
C. F. Curwen . . . . Treas. Dinsmore Mfg. Co. . . . . Salem, Mass. . . . . Apr. 27, 1899.
Joseph L. Cushing . . Mfr. of Cotton Conveying Systems, Daniel Cushing & Co., .
. . . . . Box 885, Lowell, Mass. . . . . Apr. 26, 1900.

Frederick I. Dana . . . Manager. Thomas Phillips Co. . . . Providence, R. I. . . Apr. 24, 1895.
John O. DeWolf, . . . Mech. Engineer, 1012 Tremont Bldg., Boston, Mass. . . . Apr. 25, 1901.
C. E. W. Dow . . . . Agt. American Moistening Co. & Wm. Firth Co. . . . . .

. . . . . 40 So. Forsyth St., Box 410, Atlanta, Ga. . . . . Apr. 24, 1895.
Frederick A. Downes . Sec. Factory Mutual Fire Insurance Cos. . . . . .
. . . . . 925 Chestnut St., Philadelphia, Pa. . . Oct. 27, 1897.
W. L. Draper . . . . Mgr. Dodge Mfg. Co. . . . . .
. . . . . Atlanta Branch, 522 Prudential Building, Atlanta, Ga. . . . . Oct. 18, 1900.

Fred W. Easton, . . . Treas. Easton & Burnham Machine Co., ...
. . . . . 180 Weeden St., Pawtucket, R. I. . . Apr. 25, 1901.
G. B. Emmons . . . . Pres. Emmons Loom Harness Co. . . . . .
. . . . . May St., Lawrence, Mass. . . Oct. 24, 1895.
T. C. Entwistle . . . . Cotton Machinery Builder . . . . . .
. . . . . 297 Market St., Lowell, Mass. . . . . Apr. 24, 1895.

D. D. Felton . . . . . Treas. S. A. Felton & Son Co. . . . Manchester, N. H. . Apr. 24, 1895.
John W. Ferguson . . Contractor . . . . . .
. . . . . Paterson Nat. Bank Bldg., Paterson, N. J. . . . Apr. 24, 1895.
Redington Fiske . . . Gen. Mgr. Planters Compress Co. . . . . .
. . . . . 183 Essex St., Boston, Mass. . . . Apr. 27, 1899.
J. Herbert Foster . . . Cotton Broker . 10 South Water St., Providence, R. I. . . Apr. 24, 1895.
Merrill A. Furbush . . . . . 2015 North 33rd St., Philadelphia, Pa. . . Oct. 27, 1897.
John T. Fyans . . . . Agt. Fyans, Frazer & Blackway Co. . . . . .
. . . . . 411 Beach St., Fall River, Mass. . . Apr. 28, 1897.

H. P. Garland . . . . Treas. Loom Picker Co. . . . . Biddeford, Me. . . . Oct. 24, 1895.
Royal W. Gates . . . . Josiah Gates & Sons, Belting . . . . . .
. . . . . 307 Market St., Lowell, Mass. . . . Apr. 24, 1895.
Rufus B. Goff . . . . Pres. Standard Mill Supply Co. . . . . .
. . . . . 77 Exchange Pl., Box 714, Providence, R. I. . . Apr. 28, 1897.
Sumner S. Gould . . . Mgr. Lowell Branch American Card Clothing Co. . . . .
. . . . . Lowell, Mass. . . . Oct. 5, 1899.
William S. Granger . . Prest. Granger Foundry & Machine Co., Providence, R. I. . Apr. 24, 1895.
Henry T. Grant, Jr. . . Pres. Mercantile Mutual Fire Ins. Co. . . . . .
. . . . . Box 1153, 723 Banigan Building, Providence, R. I. . . Oct. 27, 1897.
Arthur F. Gray . . . . Mill Architect and Engineer . . . . . .
. . . . . 53 State St., Room 509, Boston, Mass. . . . Oct. 18, 1900.

A. Walter Harris . . . Treas. A. W. Harris Oil Co. . . . . .
. . . . . 326 So. Water St., Providence, R. I. . . Oct. 24, 1895.
Alfred H. Hartley . . Dealer in Oils and Mill Supplies . . . . . .
. . . . . Box 409, Fall River, Mass. . . Oct. 27, 1897.
Jerome Hill . . . . . Pres. Tennessee Planters' Co. . . . . .
. . . . . 334 Front St., Memphis, Tenn. . . . Apr. 29, 1896.
Richard H. Hill . . . Gen. Sales Agt. James Hunter Machine Co. . . . . .
. . . . . 70 Kilby St., Boston, Mass. . . . . Apr. 26, 1900.
Alfred K. Hobbs . . . Rubber, Leather and Mill Supplies . Manchester, N. H. . Oct. 18, 1900.

John Hogg . . . . . Smith, Hogg & Gardiner, 144 Essex St., Boston, Mass. . . . Apr. 27, 1899.
Henry A. Holcomb . . . . . Box 249, New Bedford, Mass. . Oct. 24, 1895.
Henry S. Houghton, Sr., Mfr. Grids and Beaters, 61 Pond St., Woonsocket, R. I. . Apr. 28, 1897.
Lemuel R. Howe . . . Importer & Dealer in Dye Stuffs, Howe, Fuller & Trunkett,
. . . . . 92 State St., Boston, Mass. . . . Apr. 25, 1901.
C. H. Hutchins . . . . Pres. Crompton & Knowles Loom Works . . . . . .
. . . . . Worcester, Mass. . . Oct. 24, 1895.

David Jackson . . . { Pres. and Mgr. Jackson Pat. Shell Roll Co. . . . . } Pawtucket, R. I. . . Apr. 24, 1895.

William B. Kehew . . The Kehew-Bradley Co. . 24 Purchase St., Boston, Mass. . Apr. 24, 1895.
James H. Kendall . . Edward Kendall & Sons . . . . . Cambridgeport, Mass., Sept. 29, 1898.
John E. Kendrick . . . Gen. Agt. American Supply Co. . . . . .
. . . . . Box 822, Providence, R. I. . . Oct. 5, 1899.
Frank B. Kenney . . . Kitson Machine Co. . . . . Lowell, Mass. . . . Oct. 5, 1899.

W. C. Langford . . . Oil Dealer, . . . 86 Weybosset St., Providence, R. I. . . Apr. 27, 1899.
Josiah M. Lasell . . . Asst. Treas. Whitin Machine Works, Whitinsville, Mass. . Apr. 24, 1895.
Samuel D. Lawton . . Treas. Fall River Machine Co. . . . Fall River, Mass. . . Oct. 18, 1900.
John H. Lorimer . . . Builder of Textile Machines . . . . . .
. . . . . Ontario and Lawrence Sts., Philadelphia, Pa. . . Oct. 27, 1897.
Stephen C. Lowe . . . Agt. John Hetherington & Sons, Ltd., ...
. . . . . 186 Devonshire St., 41-42 Brewer Bldg., Boston, Mass. . . . Oct. 24, 1895.
George A. Lowry . . . Consulting Eng., . 299 Marginal St., East Boston, Mass. . Apr. 28, 1898.

Francis E. Macomber . Mill Supplies . . . . 21 Pearl St., Boston, Mass. . . . . Apr. 26, 1900.
F. H. Maynard . . . . Bus. Mgr. Gen. Fire Extinguisher Co., Providence, R. I. . . Apr. 24, 1895.
John McCullough, . . . Cotton Waste Merchant . . . . . New Bedford, Mass. . April 25, 1901.
D. E. McGaw . . . . Mgr. Supply Dept.. Southern Belting Co. . . . . .
. . . . . P. O. Box 63, Atlanta, Ga. . . . . Oct. 18, 1900.
H. G. McKerrow . . . Textile Machinery Importer . . . . . .
. . . . . 31 State St., Boston, Mass. . . . Sept. 22, 1896.
D. K. McLaren . . . . Mfr. of Leather Belting 751 Craig St., Montreal, P. Q., Can. Apr. 26, 1900.
George H. Meader . . Steam Appliances . . 35 Oliver St., Boston, Mass. . . . Apr. 24, 1895.
John R. Mitchell . . . Mitchell-Bissell Co. . 134 Dexter St., Malden, Mass. . . . Oct. 18, 1900.
Charles B. Moore . . . Agt. Knowles Steam Pump Works . . . . . .
. . . . . 54 Oliver St., Boston, Mass. . . . . Apr. 26, 1900.
George B. Morison . . Catlin & Co. . . . 67 Chauncy St., Boston, Mass. . . . . Apr. 24, 1895.

John H. Nelson . . . . Treas. William Firth Co. . . . . .
. . . . . 67 Equitable Building, Box. 1460, Boston, Mass. . . . . Apr. 26, 1900.
George C. Newell . . . Starkweather & Shepley . . . . . .
. . . . . 17 Custom House St., Providence, R. I. . . Sept. 29, 1898.
William R. Noone . . Commission Merchant, 102 South St., Boston, Mass. . . . Oct. 27, 1897.

Sidney B. Paine . . . General Electric Co., 200 Summer St., Boston, Mass. . . . Apr. 24, 1895.
Arthur Parkinson . . . Selling Agt. Arabol Mfg. Co., 13 Gold St., New York, N. Y. Apr. 28, 1897.
Stephen Minot Pitman . Sec'y Narragansett Mutual Fire Insurance Co. . . . . Box 315, Providence, R. I. . . . Apr. 24, 1895.
Vladimir P. Polevoy . { Agent Great Yaroslavskaia Cotton Mill (of Yaroslave), Russia . . . } 120 Broadway, N. Y. Apr. 28, 1897.
Charles A. M. Praray . Chas. A. M. Praray & Co., Mill Architect and Engineer . . . . . 832 and 833 Banigan Building, Providence, R. I. . . . Apr. 28, 1897.

Charles F. Randall . . Expert in Textiles . . . . . Room 350, Tremont Building, Boston, Mass. . . . Apr. 24, 1895.
Peleg A. Rhodes . . . Inspector of Cotton Mills . . . . . P. O. Box 315, Providence, R. I. . . Oct. 5, 1899.
Richard H. Rice . . . Treas. Providence Engineering Works . . . . . 521 So. Main St., Providence, R. I. . . . Apr. 24, 1895.
E. R. Richardson . . . Asst. Treas. American Machine Co. . . . . Box 678, Pawtucket, R. I. . . Apr. 26, 1900.
C. E. Roberts . . . . Mgr. Hartford Steam Boiler Insurance & Inspection Co. . . . . 125 Milk St., Boston, Mass. . . . Apr. 24, 1895.
Louis E. Robinson . . Cotton Agent Sea Island Cotton . . . . . 34 So. Water St., Providence, R. I. . . Oct. 27, 1897.
George I. Rockwood, . Mechanical Engineer, 62 Summer St., Worcester, Mass. . Apr. 25, 1901.
E. A. Rusden . . . . Treas. Rusden Machine Co. . . . . Warren, R. I. . . . Oct. 18, 1900.
John M. Russell . . . . . Treas. Crompton & Knowles Loom Works . . . . . Worcester, Mass. . . Oct. 24, 1895.

Dwight Seabury . . . Mill Engineer, . . . 12 East Ave., Pawtucket, R. I. . . Apr. 25, 1901.
J. Foster Searles . . . Treas. American Loom Co. . . . . Readville, Mass. . . Apr. 26, 1900.
J. A. Shepherd . . . . N. E. Mgr. The Stirling Co. . . . . 53 State St., Room 631, Exchange Building, Boston, Mass. . . . Oct. 18, 1900.
Harry M. Smith . . . Vice-Pres. Standard Mill Supply Co. . . . . 77 Exchange Pl., Box 714, Providence, R. I. . . Apr. 28, 1897.
R. Paul Snelling . . . Treas. Saco and Pettee Machine Shops . . . . . Newton Upper Falls, Mass. . Sept. 22, 1896.
Henry C. Spence . . . Gen. Mgr. Metallic Drawing Roll Co. Indian Orchard, Mass. Apr. 24, 1895.
George W. Stafford . . Mgr. Crompton & Knowles Loom Works . . . . . Providence, R. I. . . Apr. 24, 1895.
H. E. Stafford . . . . Asst. Mgr. Crompton & Knowles Loom Works . . . . . Providence, R. I. . . Oct. 18, 1900.
James Strang . . . . Selling Agt. Metallic Drawing Roll Co. . . . . 123 Hampden St., Indian Orchard, Mass. Oct. 27, 1897.
William H. Stratton . . Mgr. Factory Insurance Association . . . . . 95 Pearl St., Hartford, Conn. . . Apr. 28, 1897.
Daniel J. Sully . . . . Cotton Broker, T. M. Reynolds & Co., ... 34 South Water St., Providence, R. I. . . Apr. 24, 1895.
John Sykes, J. P. . . . Pres. English Card Clothing Co. . . . . Acre House, Huddersfield, Eng. . Oct. 18, 1900.

Cyrus A. Taft	Agt. Whitin Machine Works	Whitinsville, Mass.	Apr. 24, 1895.
Charles F. Taylor	Successor to Burgess Cop Tube Co., 21 Eddy St.	Providence, R. I.	Apr. 28, 1898.
James T. Thornton	Sec. and Treas. A. B. Pitkin Machinery Co.	Providence, R. I.	Oct. 18, 1900.
Rienzi W. Thurston	Machinery Manufacturer	Fall River, Mass.	Oct. 18, 1900.
George E. Tillinghast	Treas. Tillinghast, Stiles Co. Industrial Trust Bldg., 49 Westminster St.	Providence, R. I.	Oct. 18, 1900.
H. A. Tillinghast,	Treas. Granger Foundry & Mach. Co.	Providence, R. I.	Apr. 25, 1901.
A. Curtis Tingley	Treas. National Ring Traveler Co. 7 Eddy St.	Providence, R. I.	Sept. 22, 1896.
William V. Threlfall	Selling Agt. Saco and Pettee Machine Shops	Biddeford, Me.	Apr. 24, 1895.
Allison W. Trafford	Mfr. of Ring Travelers 116 Pocasset St.	Fall River, Mass.	Apr. 26, 1900.
Frank H. Underwood	Resident Mgr. Dodge Mfg. Co. 137 Purchase St.	Boston, Mass.	Apr. 29, 1896.
Clement A. Wakefield	Selling Agt. Saco & Pettee Machine Shops,	Biddeford, Me.	Apr. 25, 1901.
Justin A. Ware	Crompton & Knowles Loom Works	Worcester, Mass.	Oct. 24, 1895.
Lettice R. Washburn	Mill Contractor, 235 North Water St.	New Bedford, Mass.	Oct. 5, 1899.
Walter S. Watson	Haworth & Watson, Mfrs. Paper Tubes for Textile Manufg. Box 996,	Lowell, Mass.	Oct. 24, 1895.
Stephen M. Weld,	Cotton Buyer 89 State St.,	Boston, Mass.	Apr. 27, 1899.
William R. West	Roll Coverer 830 Purchase St.,	New Bedford, Mass.	Sept. 22, 1896.
W. W. White	Agent Holyoke Machine Co.	Worcester, Mass.	Apr. 27, 1899.
G. Marston Whitin	Treas. Whitin Machine Works	Whitinsville, Mass.	Apr. 24, 1895.
Fred A. Wilde	Asst. Mgr. The A. T. Atherton Machine Co. 96 Broad St.,	Pawtucket, R. I.	Apr. 28, 1897.
Erving Yale Woolley	Stoddard, Haserick, Richards & Co. 152 Congress St.,	Boston, Mass.	Apr. 24, 1895.

Honorary Members	3
Active Members	506
Associate Members	138
Total Membership	647

MEMBERS OF THE ASSOCIATION,

April 26, 1901.

ARRANGED BY STATES.

MAINE.

Auburn	William Hayes	Barker Mill.
Bath	Harry W. Kimball	
Biddeford	H. P. Garland	Loom Picker Co.
Biddeford	Robert McArthur	Pepperell Mfg. Co.
Biddeford	William V. Threlfall	Saco & Pettee Machine Shops.
Biddeford	Clement A. Wakefield	Saco & Pettee Machine Shops.
Brunswick	Russell W. Eaton	Cabot Manufg. Co.
Kennebunk	Robert W. Lord	R. W. Lord & Co.
Lewiston	Joseph P. Battles	Lewiston Mach. Co.
Lewiston	George W. Bean	Androscoggin Mills.
Lewiston	H. B. Estes	Continental Mills.
Lewiston	William D. Pennell	Hill Manufg. Co.
Lewiston	Herbert L. Pratt	Bates Manufg. Co.
Lewiston	James A. Walsh	Lewiston Bleachery and Dye Works
Lisbon	W. H. Miles	Farwell Mills.
Saco	James G. Garland	
Saco	Elmer E. Page	York Manufg. Co.
Sanford	Louis B. Goodall	Goodall Worsted Co.
Westbrook	Philip Dana	Dana Warp Mills.
Westbrook	Woodbury K. Dana	Dana Warp Mills.

NEW HAMPSHIRE.

Charlestown	Samuel Webber	Hydraulic Engineer.
Claremont	Frank P. Vogl	Monadnock Mills.
Dover	Charles H. Fish	Cocheco Manufg. Co.
Dover	George A. Hurd	Cocheco Mfg. Co.

Exeter	Hervey Kent	Exeter Manufg. Co.
Greenville	Frederick W. Ely	Columbian Manufg. Co.
Manchester	Henry D. Bourne	Hooksett Mills.
Manchester	Stephen N. Bourne	Stark Mills.
Manchester	French Campbell	75 Granite St.
Manchester	George A. Clark	Manchester Mills.
Manchester	D. D. Felton	S. A. Felton & Son Co.
Manchester	Alfred K. Hobbs	Rubber, Leather and Mill Supplies.
Manchester	Elliott Cowdin Lambert	Amoskeag Manufg. Co.
Manchester	Charles H. Manning	Amoskeag Manufg. Co.
Manchester	Charles D. McDuffie	Manchester Mills.
Manchester	Herman F. Straw	Amoskeag Manufg. Co.
Manchester	George F. Whitten	Amory Manufg. Co.
Manchester	John H. Whitten	Stark Mills.
Milford	M. F. Foster	
Milford	Frank E. Kaley	Morse & Kaley Manufg. Co.
Nashua	William D. Cadwell	Nashua Manufg. Co.
Nashua	William H. Cadwell	Jackson Co.
Nashua	Roscoe S. Milliken	Nashua Mfg. Co.
Penacook	Marcellus Gould	N. H. Spinning Co.
Penacook	F. E. Wattles	Boscawen Mills.
Pittsfield	George E. Kent	Exeter Manufg. Co. & Pittsfield Mills.
Salmon Falls	O. S. Brown	Salmon Falls Manufg. Co.
Somersworth	Charles H. Plummer	Great Falls Manufg. Co.
Suncook	David L. Jewell	China, Webster & Pembroke Mills.
Suncook	Edmund E. Truesdell	China, Webster & Pembroke Mills.

VERMONT.

North Pownal	Thomas Armstrong	North Pownal Manufg. Co.

MASSACHUSETTS.

Adams	John S. Adams, Jr.	Adams Bros. Manufg. Co.
Adams	James C. Chalmers	Renfrew Mfg. Co.
Adams	Z. D. Hall	Berkshire Cotton Manufg. Co.
Adams	A. B. Mole	Greylock Mill.
Adams	Charles T. Plunkett	Berkshire Cotton Manufg. Co.
Adams	L. B. Renfrew	Renfrew Mfg. Co.
Amesbury	M. W. Quinn	Hamilton Woolen Co.
Andover	John W. Bell	Smith & Dove Manufg. Co.
Belmon	John Kilburn	
Blackstone	George E. Spofford	Blackstone Manufg. Co.
Bondsville	Elmer G. Childs	Boston Duck Co.
Bondsville	Walter B. Hall	Boston Duck Co.

Boston	Charles B. Amory	Hamilton Mfg. Co.
Boston	Frederic Amory	40 Water St.
Boston	Eugene C. Andres	577 John Hancock Building.
Boston	Edward Atkinson	31 Milk St.
Boston	E. W. Atkinson	152 Congress St.
Boston	Nathaniel F. Ayer	518 Beacon St.
Boston	Edwin Barnes	67 Equitable Building.
Boston	Frank P. Bennett	Am. Wool and Cotton Reporter.
Boston	F. H. Bishop	95 South St.
Boston	Arthur T. Bradlee	Harding, Whitman & Co.
Boston	J. Payson Bradley	24 Purchase St.
Boston	Henry G. Brinckerhoff	53 State St.
Boston	John H. Burghardt	31 Pearl St.
Boston	Alfred Clarke,	23 Central St.
Boston	Frank B. Comins	150 Devonshire St., Room 67.
Boston	Alphonse S. Covel	70 Kilby St.
Boston	Augustus De Cort	P. O. Box 2815.
Boston	P. Y. DeNormandie	30 Kilby St.
Boston	Frederic C. Dumaine	Amory Mfg. Co.
Boston	John O. DeWolf	Mech. Engineer.
Boston	Ambrose Eastman	53 State St.
Boston	William Firth	Am. Moist. Co. and Wm. Firth Co.
Boston	Redington Fiske	183 Essex St.
Boston	Alfred M. Goodale	50 State St.
Boston	Arthur F. Gray	53 State St., Room 509.
Boston	Stephen Greene	93 Federal St.
Boston	Richard H. Hill	70 Kilby St.
Boston	Franklin W. Hobbs	Arlington Mills.
Boston	John Hogg	Smith, Hogg & Gardiner.
Boston	Henry S. Howe	68 Chauncy St.
Boston	Lemuel R. Howe	Howe, Fuller & Trunkett.
Boston	Charles W. Hubbard	Ludlow Mfg. Co.
Boston	William B. Kehew	24 Purchase St.
Boston	Evan Arthur Leigh	70 Kilby St.
Boston	William C. Lovering	40 Water St.
Boston	Stephen C. Lowe	John Hetherington & Sons.
Boston	A. Lawrence Lowell	Lowell School of Design.
Boston	Herbert Lyman	P. O. Box 1717.
Boston	Francis E. Macomber	21 Pearl St.
Boston	Charles T. Main	1112 Exchange Building.
Boston	Fred C. McDuffie	40 Water St.
Boston	H. G. McKerrow	31 State St.
Boston	George H. Meader	35 Oliver St.
Boston	Charles B. Moore	54 Oliver St.
Boston	George B. Morison	67 Chauncy St.
Boston	John H. Nelson	P. O. Box 1460.
Boston	William R. Noone	102 South St.

Boston	Sidney B. Paine	200 Summer St.
Boston	Francis J. Parker	81 Milk St.
Boston	Benjamin Phipps	Union Mfg. Co.
Boston	Charles F. Randall	350 Tremont Building.
Boston	Charles E. Riley	281 Congress St.
Boston	C. E. Roberts	125 Milk St.
Boston	Arnold B. Sanford	67 Chauncy St.
Boston	J. Herbert Sawyer	Care H. B. Sawyer, 93 Federal St.
Boston	George H. Shapley	78 Chauncy St.
Boston	J. A. Shepherd	631 Exchange Building.
Boston	William F. Sherman	27 State St.
Boston	James P. Tolman	115 Congress St.
Boston	Edward B. Townsend	Warwick Mills.
Boston	Charles D. Turnbull	Wm. A. Slater Mills Corp.
Boston	Frank H. Underwood	137 Purchase St.
Boston	Frederick T. Walsh	Thomas Leyland & Co.
Boston	Stephen M. Weld	89 State St.
Boston	William Whitman	Arlington Mills.
Boston	Franklin D. Williams	Fiskdale Mills.
Boston	Erving Yale Woolley	152 Congress St.
Cambridgeport	James H. Kendall	Edward Kendall & Sons.
Cambridgeport	Henry B. Sprague	Boston Woven Hose & Rubber Co.
Canton	Willis S. Shepard	Amer. Net & Twine Co.
Canton Junction	Joseph W. Wattles	Manufacturers' Supplies.
Chicopee Falls	Henry A. Bailey	Chicopee Manufg. Co.
Clinton	William G. McLoon	Lancaster Mills.
Clinton	Charles H. Richardson	Lancaster Mills.
Clinton	John R. Rostron	Lancaster Mills.
Clinton	George P. Taylor	Danielsonville Cotton Co.
Clinton	George W. Weeks	
East Boston	George A. Lowry	299 Marginal St.
East Hampton	William B. Fittz	West Boylston Mfg. Co.
Fall River	F. S. Akin	Cornell Mills.
Fall River	Henry Ashworth	Agt. for Card Clothing Manufr.
Fall River	John P. Bodge	Arkwright Mills.
Fall River	Jefferson Borden, Jr.	Fall River Bleachery Co.
Fall River	Nathaniel B. Borden	Barnard Manufg. Co.
Fall River	Richard B. Borden	Richard Borden Mfg. Co.
Fall River	Thomas J. Borden	326 North Main St.
Fall River	Isaac A. Brown	Narragansett Mills.
Fall River	George A. Chace	Bourne Mills.
Fall River	Simeon B. Chase	King Phillip Mills.
Fall River	John A. Collins	American Linen Co.
Fall River	B. D. Davol	Barnard Manufg. Co.
Fall River	Frank H. Dwelly	Tecumseh Mills.
Fall River	David H. Dyer	D. H. Dyer & Son.
Fall River	William Evans	Richard Borden Manufg. Co.

Fall River	John T. Fyans	Fyans, Frazer & Blackway Co.
Fall River	Daniel Gilligan	Pocasset & Metacomet Mills.
Fall River	Effingham C. Haight	Wampanoag Mills.
Fall River	Arthur M. Hamilton	Parker Mills.
Fall River	John F. Hamlet	709 Maple St.
Fall River	Alfred H. Hartley	Oils and Mill Supplies.
Fall River	Samuel E. Hathaway	Fall River Iron Works Co.
Fall River	William Hathaway	Barnard Mfg. Co.
Fall River	William B. Hawes	P. O. Box 733.
Fall River	George H. Hills	Davol Mills and Stevens Mfg. Co.
Fall River	William P. Holt	Barnaby Mills.
Fall River	Benjamin B. Kirk	Fall River Iron Works Co.
Fall River	George H. Law	Merchants' Mfg. Co.
Fall River	Samuel D. Lawton	Fall River Machine Co.
Fall River	Leontine Lincoln	Seaconnet Mills.
Fall River	Philip A. Mathewson	King Philip Mills.
Fall River	Thomas McAuliffe	Stevens Manufg. Co.
Fall River	J. Edward Osborn	American Linen Co.
Fall River	Herbert W. Owen	Merchants' Mfg. Co.
Fall River	Joseph H. Potter, Jr.	Durfee Mills.
Fall River	Benj. H. Roberts	163 Grove St.
Fall River	Charles M. Shove	Granite Mills.
Fall River	Abbott E. Slade	Laurel Lake Mills.
Fall River	J. C. Smith	Chace Mills.
Fall River	John Sullivan	Union Cotton Manufg. Co.
Fall River	Timothy Sullivan	Davol Mills.
Fall River	Richard Thackeray	Weetamoe Mills.
Fall River	Rienzi W. Thurston	Machinery Manufacturer.
Fall River	Horace W. Tinkham	Robeson Mills.
Fall River	Allison W. Trafford	Mfr. Ring Travelers.
Fall River	Robinson Walmsley	Tecumseh Mills.
Fall River	Joseph Watters	Osborn Mills.
Fisherville	Albert W. Dimick	Fisher Mfg. Co.
Fisherville	Charles W. Fisher	Fisher Mfg. Co.
Fiskdale	John Gregson	Fiskdale Mills.
Fitchburg	George P. Grant, Jr.	Grant Yarn Co.
Fitchburg	W. E. Keach	Grant Yarn Co.
Fitchburg	John Leiper	Fitchburg Worsted Mills.
Fitchburg	Arthur H. Lowe	Parkhill Manufg Co.
Fitchburg	David Lowe	Parkhill Manufg. Co.
Fitchburg	Thomas C. Sheldon	Fitchburg Duck Mills.
Fitchburg	Walter F. Stiles	Orswell Mills.
Fitchburg	Ralph E. Thompson	Parkhill Manufg. Co.
Great Barrington	Jno. H. C. Church	Monument Mills.
Greenfield	James C. Deane	Mass. Tool Co.
Holyoke	Ernest Lovering	Lyman Mills.
Holyoke	W. Marshall Taylor	34 Arlington St.

Hopedale	Eben S. Draper	Draper Co.
Hopedale	George A. Draper	Draper Co.
Hopedale	George Otis Draper	Draper Co.
Hopedale	William F. Draper	Draper Co.
Hopedale	William F. Draper, Jr.	Draper Co.
Housatonic	T. G. Ramsdell	Monument Mills.
Hyde Park	T. B. Stevenson	Readville Cotton Mill.
Indian Orchard	William C. Godfrey	Indian Orchard Co.
Indian Orchard	Henry C. Spence	Metallic Drawing Roll Co.
Indian Orchard	James Strang	Metallic Drawing Roll Co.
Ipswich	James W. Brown	Box 312.
Lawrence	William A. Barrell	Lawrence Duck Co.
Lawrence	Eugene E. Burnham	252 Lowell St.
Lawrence	G. B. Emmons	Emmons Loom Harness Co.
Lawrence	William D. Hartshorne	Arlington Mills.
Lawrence	James I. Milliken	Everett Mills.
Lawrence	Walter E. Parker	Pacific Mills.
Lawrence	Robert Redford	Box 28.
Lawrence	Francis H. Silsbee	Pacific Mills.
Lawrence	William D. Twiss	Everett Mills.
Lawrence	William S. Whitney	American Woolen Co.
Lawrence	Eben C. Willey	Atlantic Cotton Mills.
Leicester	Charles A. Denny	American Card Clothing Co.
Linwood	Amos G. Maddox	Linwood Mill.
Linwood	Fred B. Whitin	Uxbridge Cotton Mills.
Lowell	Franklin Allen	Boott Mills.
Lowell	George E. Ames	Lawrence Manufg. Co.
Lowell	Frank A. Bowen	Appleton Co.
Lowell	Edward N. Burke	Lowell Machine Shop.
Lowell	W. W. Carey	Wood Rim Pulleys and Wood Working Machinery.
Lowell	Clarence N. Childs	Hamilton Mfg. Co.
Lowell	A. G. Cumnock	Appleton Co.
Lowell	Joseph L. Cushing	Daniel Cushing & Co.
Lowell	Albert W. Danforth	Shanghai Cotton Cloth Mills.
Lowell	Albert Deabill	Lowell Hosiery Co.
Lowell	Edward P. Dennis	Lowell Machine Shop.
Lowell	William A. Eastman	Lowell Hosiery Co.
Lowell	T. C. Entwistle	Cotton Machinery Builder.
Lowell	Frederick A. Flather	Lowell Machine Shop.
Lowell	Royal W. Gates	Josiah Gates & Sons.
Lowell	Sumner S. Gould	Lowell Branch Am. Card Clo. Co.
Lowell	William E. Hall	Shaw Stocking Co.
Lowell	Otis L. Humphrey	Cotton Dept. Lowell Textile School.
Lowell	A. W. Hunking,	374 Stevens St.
Lowell	Frank B. Kenney	Kitson Machine Co.
Lowell	Nathaniel B. Kerr	Boott Cotton Mills.

Lowell	Alvin S. Lyon	Bigelow Co.
Lowell	Albert H. Morton	Kitson Machine Co.
Lowell	Oliver H. Moulton	Hamilton Manufg. Co.
Lowell	Franklin Nourse	Lawrence Manufg. Co.
Lowell	John W. Pead	Merrimac Manufg. Co.
Lowell	Haven C. Perham	Kitson Machine Co.
Lowell	M. A. Rawlinson	Tremont & Suffolk Mills.
Lowell	Edwin A. Robinson	Tremont and Suffolk Mills.
Lowell	William S. Southworth	Mass. Cotton Mills.
Lowell	Edward W. Thomas	Tremont and Suffolk Mills.
Lowell	Charles T. Upton	63 Mt. Vernon St.
Lowell	Jude C. Wadleigh	Mass. Cotton Mills.
Lowell	Walter S. Watson	Haworth & Watson.
Lowell	Channing Whitaker	Lowell Machine Shop.
Lowell	Nelson Whittier	Whittier Mills.
Lynn	C. J. H. Woodbury	61 Commercial St.
Malden	John R. Mitchell	Mitchell-Bissell Co.
Manchaug	Charles M. Holmes	Manchaug Co.
Medford	H. B. Ashton	S. A. Felton & Son Co.
Methuen	Lewis E. Barnes	Pemberton Co. and Methuen Co.
Millbury	Fred W. Moore	Cordis Mills.
Millbury	Henry M. Wilcox	John Rhodes Warp Co.
New Bedford	George A. Ayer	City & Bristol Mfg. Corps.
New Bedford	Christopher P. Brooks	New Bedford Textile School.
New Bedford	Robert Burgess	Grinnell Mfg. Corp.
New Bedford	Byron F. Card	Howland Mills.
New Bedford	William W. Crapo	Wamsutta Mills.
New Bedford	Frederick Grinnell	Gen. Fire Extinguisher Co.
New Bedford	Henry A. Holcomb	Box 249.
New Bedford	Thomas Horsfield	95 Bonney St.
New Bedford	Walter H. Langshaw	Dartmouth Manufg. Corp.
New Bedford	Frederick B. Macy	Soule Mills.
New Bedford	John McCullough	Cotton Waste Merchant.
New Bedford	John Neild	Wamsutta Mills.
New Bedford	Albert R. Pierce	Pierce Mfg. Corporation.
New Bedford	Andrew G. Pierce, Jr.	Pierce Mfg. Corp.
New Bedford	Frederick W. Reynolds	Potomska Mills.
New Bedford	James O. Thompson, Jr.	Wamsutta Mills.
New Bedford	Herbert E. Walmsley	Wamsutta Mills.
New Bedford	Lettice R. Washburn	235 North Water St.
New Bedford	William R. West	830 Purchase St.
New Bedford	Benjamin Wilcox	City and Bristol Mfg. Co.
Newton	Josiah G. Coburn	99 Washington St.
Newtonville	Oscar B. Truesdell	18 Washington Terrace.
Newton Upper Falls	Frank J. Hale	Saco and Pettee Machine Shops.
Newton Upper Falls	R. P. Snelling	Saco and Pettee Machine Shops.
North Adams	Hervey Burnham	Beaver Mills and Eclipse Mill.

North Adams	Charles W. Dennett	Johnson Manufg. Co. and Dunbar Mills Co.
North Adams	H. C. Phillips	Greylock Mills.
North Adams	J. F. Powers	Eagle Mill.
Northbridge	Henry S. Houghton, Jr.	Paul Whitin Manufg. Co.
Northbridge	Henry T. Whitin	Paul Whitin Manufg. Co.
North Cambridge	Colin C. Bell	Laminar Fibre Co.
North Oxford	Edwin N. Bartlett	Sigourney and Rockdale Mills.
North Plymouth	Gideon F. Holmes	Plymouth Cordage Co.
Readville	J. Foster Searles	American Loom Co.
Salem	C. F. Curwen	Dinsmore Mfg. Co.
Salem	William P. McMullen	Naumkeag Steam Cotton Co.
Salem	Nathaniel G. Simonds	Naumkeag Steam Cotton Co.
Saundersville	Thomas Wilmarth	Saunders Cotton Mills.
Shattuckville	Frank S. Field	Massaemit Yarn Mills.
Shirley	Henry D. Martin.	
South Hadley Falls	William R. Hill	Glasgow Manufg. Co.
Springfield	Joseph M. Dunham	43 Edwards St.
Taunton	A. C. Bent	Safety Seamless Pocket Co.
Taunton	William H. Bent	Mason Machine Works.
Taunton	John J. Connell	Cohannet Mills.
Taunton	Peter H. Corr	Greenwich Bleachery.
Taunton	Thomas G. Cox	Mason Machine Works.
Taunton	P. T. Creed	Hopewell Mills.
Taunton	H. H. Culver	Elizabeth Poole Mills.
Taunton	Henry S. Culver	Westville Cotton Mills.
Taunton	Herbert Fisher	
Taunton	Henry M. Lovering	Whittenton Manufg. Co.
Taunton	William M. Lovering	Whittenton Manufg. Co.
Taunton	Charles L. Macomber	Winthrop Cotton Yarn Co.
Taunton	John Tempest Meats	Mason Machine Works.
Taunton	Herbert H. Shumway	Corr Manufg. Co.
Taunton	James W. Taylor	Canoe River Mills.
Taunton	Joseph S. Tidd	Oakland Mills.
Thorndike	Charles H. Hobbs	Thorndike Co.
Three Rivers	Roscius C. Newell	Palmer Mill.
Turners Falls	Samuel L. Parker	Turners Falls Cotton Mills.
Waltham	Charles E. Getchell	Waltham Bleachery & Dye Works.
Waltham	Arthur H. Gulliver	Boston Mfg. Co.
Ware	George E. Tucker	The Otis Co.
West Warren	George A. Moody	West Warren Cotton Mills.
Whitinsville	Alfred E. Adams	Whitinsville Cotton Mills and Linwood Mills.
Whitinsville	Josiah M. Lasell	Whitin Machine Works.
Whitinsville	Oscar L. Owen	Whitin Machine Works.
Whitinsville	Cyrus A. Taft	Whitin Machine Works.
Whitinsville	Arthur F. Whitin	Saunders Cotton Mills.

Whitinsville	G. Marston Whitin	Whitin Machine Works.
Williamstown Sta.	Roland R. Kelly	Williamstown Manufg. Co.
Winchester	George H. Sayward	
Worcester	George Crompton	
Worcester	Randolph Crompton	
Worcester	Henry F. Harris	W. Boylston Mfg. Co.
Worcester	C. H. Hutchins	Crompton & Knowles Loom Works.
Worcester	F. H. Rice	340 Main St.
Worcester	Geo. I. Rockwood	62 Summer St.
Worcester	John M. Russell	Crompton & Knowles Loom Works.
Worcester	Justin A. Ware	Crompton & Knowles Loom Works.
Worcester	W. W. White	Holyoke Machine Co.
Worcester	Alfred N. Whiting	L. M. Harris Mfg. Co.

RHODE ISLAND.

Allenton	R. A. Gray	Rodman Manufg. Co.
Ashton	Charles H. Collins	Berkeley Co.
Ashton	Robert Stewart	Ashton Mills.
Bayside	Abel T. Atherton	Machine Maker.
Central Falls	Louis B. Barker	United States Cotton Co.
Central Falls	David Grove	United States Cotton Co.
Central Falls,	B. F. G. Linnell,	Yarns, Threads and Twines.
Central Falls	O. B. Parker	
Centreville	James T. Ferguson	Warwick Mills.
Centreville	Robert B. Treat	Centreville Cotton Mills.
Crompton	Charles D. Robinson	Crompton Co.
Davisville	Walter B. Knight	Reynolds Manufg. Co.
Fiskville	James Gee	Interlaken Dye Works.
Georgiaville	Herbert R. Farnum	Bernon Mills.
Hamilton	Joseph Warren Greene	Hamilton Web Co.
Lonsdale	Edward A. Mongeon	Lonsdale Co.'s Mills.
Manville	A. Tenny White	Manville Co.
Pawtucket	William W. Blades	Lorraine Mfg. Co.
Pawtucket	William P. Dempsey	Dempsey Bleachery & Dye Works.
Pawtucket	Henry C. Dexter	Greene & Daniels Mfg. Co.
Pawtucket	Fred W. Easton	Easton & Burnham Machine Co.
Pawtucket	William Greene	Greene & Daniels Mfg. Co.
Pawtucket	John J. Hart	Charlton Manufg. Co.
Pawtucket	David Jackson	Jackson Pat. Shell Roll Co.
Pawtucket	J. E. Jenckes	The E. Jenckes Manufg. Co.
Pawtucket	James R. MacColl	Lorraine Manufg. Co.
Pawtucket	E. R. Richardson	American Machine Co.
Pawtucket	F. C. Sayles	Baltic Mill.
Pawtucket	Dwight Seabury	12 East Ave.
Pawtucket	Fred A. Wilde	A. T. Atherton Machine Co.

Peace Dale	William C. Greene	Peace Dale Manufg. Co.
Phenix	Henry R. Brown	Hope Co. and Phenix Mill.
Pontiac	Walter H. Summersby	Pontiac Mill and Bleachery.
Providence	Charles T. Aldrich	Aldrich Manufg. Co.
Providence	William Ames	Fletcher Mfg. Co.
Providence	H. C. Atwood	Williamsville Manufg. Co.
Providence	George R. Babbitt	American Oil Co.
Providence	Edward R. Ballou	Ballou Yarn Converting Co.
Providence	Truman Beckwith	Dyerville Manufg. Co.
Providence	J. Frank Braids	Charles S. Bush Co.
Providence	D. Russell Brown	Brown Bros. Co.
Providence	H. Martin Brown	U. S. Bobbin & Shuttle Co.
Providence	E. C. Bucklin	Harris Manufg. Co. and Interlaken Mills.
Providence	Fred N. Bushnell	Narragansett Electric Light Co.
Providence	Albert L. Calder, 2nd	P. O. Box 206.
Providence	Charles H. Child	Standard Mill Supply Co.
Providence	Frederick I. Dana	Thomas Phillips Co.
Providence	A. Lockwood Danielson	Quinebaug Co.
Providence	J. DeForest Danielson	Lockwood Co. and Lewiston Bleachery and Dye Works.
Providence	John W. Danielson	Lockwood Co. and Ponemah Mills.
Providence	F. C. Fletcher	Lawton Spinning Co.
Providence	J. Herbert Foster	10 South Water St.
Providence	William Gammell	Berkeley Co.
Providence	Rufus B. Goff	Standard Mill Supply Co.
Providence	William S. Granger	Granger Foundry & Machine Co.
Providence	Henry T. Grant, Jr.	Mercantile Mutual Fire Insurance Co.
Providence	John H. Hambly	Quidnick Mfg. Co.
Providence	A. Walter Harris	A. W. Harris Oil Co.
Providence	Elisha H. Howard	Harris Textile Co.
Providence	John E. Kendrick	American Supply Co.
Providence	Jesse A. Knight	Lawton Spinning Co.
Providence	Stephen A. Knight	Hebron Manufg. Co.
Providence	Webster Knight	B. B. & R. Knights Mills.
Providence	W. C. Langford	86 Weybosset St.
Providence	Charles Warren Lippitt	Silver Spring B. & D. Co.
Providence	Henry F. Lippitt	Social and Manville Cos.
Providence	Charles R. Makepeace	Box 973.
Providence	A. T. Malcolmson	C. Bischoff & Co.
Providence	F. H. Maynard	Gen. Fire Extinguisher Co.
Providence	Thomas Mayor	Thomas Mayor & Son.
Providence	Charles H. Merriman, Jr.	Social Mfg. Co.
Providence	George C. Newell	Starkweather & Shepley.
Providence	William C. Peirce	Elizabeth Mills.
Providence	Reuben Pilling, Jr.	30 Hudson St.
Providence	Stephen Minot Pitman	Narragansett Mutual Fire Ins. Co.

Providence	Charles A. M. Praray	Chas. A. M. Praray & Co.
Providence	Peleg A. Rhodes	P. O. Box 315.
Providence	Richard H. Rice	Providence Engineering Works.
Providence	Walter Rigby	Ballou Yarn Converting Co.
Providence	George W. Robbins	Dyerville Mfg. Co.
Providence	Louis E. Robinson	36 So. Water St.
Providence	Frank P. Sheldon	Industrial Trust Building.
Providence	Harry M. Smith	Standard Mill Supply Co.
Providence	Wilton H. Spencer	7 Exchange Place.
Providence	George W. Stafford	Crompton & Knowles Loom Works.
Providence	H. E. Stafford	Crompton & Knowles Loom Works.
Providence	Daniel J. Sully	T. M. Reynolds & Co.
Providence	Robert Rennie Taft	P. O. Box 1443.
Providence	Robert W. Taft	Coventry Co.
Providence	Charles F. Taylor	21 Eddy St.
Providence	D. M. Thompson	B. B. & R. Knight's Mills.
Providence	James T. Thornton	A. B. Pitkin Machinery Co.
Providence	George E. Tillinghast	Tillinghast, Stiles Co.
Providence	H. A. Tillinghast	Granger Foundry & Machine Co.
Providence	A. Curtis Tingley	National Ring Traveler Co.
Providence	W. O. Todd	Lawton Spinning Co.
Providence	William P. Vaughan	Banigan Building.
Quidnick	Albert Knight	Quidnick Mills.
Riverpoint	Arthur F. Brackett	Royal Arctic and Valley Queen Mills.
Riverpoint	C. Prescott Knight	B. B. & R. Knight's Mills.
Valley Falls	Andrew J. Currier	Albion & Valley Falls Co.
Valley Falls	Edward B. Jennings	Samoset Co.
Warren	E. A. Rusden	Rusden Machine Co.
Warren	Arnold Schaer	Warren Manufg. Co.
Westerly	Robert Dow	Solway Mills.
Westerly	A. E. Henry	Solway Mills.
Westerly	Louis L. Hohn	122 High St.
Woonsocket	Malcolm Campbell	Woonsocket Mach. & Press Co.
Woonsocket	Henry S. Houghton, Sr.	61 Pond St.
Woonsocket	Albert C. Hoy	Hamlet Mills.
Woonsocket	Albert F. Knight	39 Main Street.
Woonsocket	William A. Robinson	Social Manufg. Co.
Woonsocket	Earl A. Thissell	Woonsocket Bobbin Co.
Woonsocket	Charles E. Thomas	Forestdale Mfg. Co.
Woonsocket	William Whittam, Jr.	Lawton Spinning Co.

CONNECTICUT.

Baltic	Harold Lawton	Baltic Mills Co.
Danielson	James Herbert Smith	Quinebaug Co.
Hartford	William H. Stratton	Factory Insurance Association.

Jewett City	Henry Osgood	Wm. A. Slater Mills Corp.
Jewett City	James O. Sweet	Ashland Cotton Co.
Jewett City	Adelbert R. Young	Ashland Cotton Co.
Killingly	W. E. Atwood	Williamsville Manufg. Co.
Killingly	C. H. Truesdell	Attawaugan Mill and Ballou Mill.
Montville	Emory S. Rathbun	Pequot Mills.
Moosup	William J. Cray	Aldrich Mfg. Co.
New Haven	George S. Barnum	The Bigelow Co.
No. Grosvenor Dale	Frank M. Messenger	Grosvenor Dale Co.
Norwich	W. N. Blackstone	Attawaugan Co. and Totokett Mills Co.
Norwich	W. R. Burnham	
Norwich	C. H. Frisbie	Attawaugan Co.
Norwich	W. G. Henderson	Shetucket Co.
Norwich	John F. Reardon	Falls Co.
Norwich	Charles D. White	Uncasville Manufg. Co.
Putnam	George W. Holt	Monohansett Manufg. Co.
Putnam	George A. Vaughan	Putnam Manufg. Co.
Taftville	Joseph D. Aiken	Ponemah Mills.
Taftville	John Eccles	Ponemah Mills.
Wauregan	James A. Atwood	Wauregan Co. & Quinebaug Co.
Wauregan	John Walter Atwood	Wauregan Co.
Willimantic	Dickerson G. Baker	American Thread Co.
Willimantic	E. S. Boss	Willimantic Linen Co.
Windsor Locks	J. R. Montgomery	The J. R. Montgomery Co.

NEW YORK.

Capron	W. H. Cloher, Jr.	Utica Cotton Co.
Chadwicks	Bradford C. Divine	Utica Willow Vale Bleaching Co.
Cohoes	David S. Johnston	Cohoes Iron Foundry & Machine Co.
Cohoes	John R. Mason	Harmony Mills.
Cohoes	John E. Prest	Harmony Mills.
Jamestown	Thomes Henry Smith	Jamestown Cotton Mill.
Newburgh	William J. Hadfield	Newburgh Steam Mills.
New York City	George Arms	Grand Hotel.
New York City	Edwin H. Baker	Bliss, Fabyan & Co.
New York City	D. C. Ball	American Cotton Co.
New York City	Percy H. Brundage	American Industrials Co.
New York City	J. E. Cheesman	Cheesman Cotton Gin Co.
New York City	Arthur B. Mann	J. H. Martin & Co.
New York City	Arthur Parkinson	Arabol Mfg. Co.
New York City	Duncan D. Parmly	Johnson Mfg. Co. & Dunbar Mills Co.
New York City	Vladimir P. Polevoy	120 Broadway.
New York Mills, Oneida Co.,	John P. Campbell,	New York Mills.
Utica	George DeForest	Utica Steam Cotton Mills.
Utica	George E. Farrell	Utica Spinning Co.

Utica	D. W. Gray	Skenandoa Cotton Co.
Utica	Henry F. Mansfield	Utica Steam Cotton Mills and Mohawk Valley Cotton Mills.
Utica	John B. Wild	Oneita Knitting Mills.
Victory Mills	Ariel C. Thomas	Saratoga Victory Mfg. Co.

NEW JERSEY.

Gloucester City	Philip H. Fowler	417 Monmouth St.
Gloucester	George W. Turner	Argo Mills Co.
Jersey City	Ernest Bridge	Jas. Chadwick & Bro. Ltd.
Jersey City	Maxwell Grierson	Jas. Chadwick & Bro., Ltd.
Millville	A. W. Brainerd	May's Landing Water Power Co. and Millville Mfg. Co.
Newark	William H. Loftus	Clark Thread Co.
New Brunswick	William H. Ritter	Johnson & Johnson.
Passaic	Dudley T. Lyall	Brighton Mills.
Passaic	William L. Lyall	J. & W. Lyall Loom and Machine Works and Brighton Mills.
Paterson	John W. Ferguson	Paterson Nat. Bank Bldg.
Vineland	John K. Russell	

PENNSYLVANIA.

Chester	W. T. Galey	Aberfoyle Manufg. Co.
Chester	D. Edwin Irving	The Irving & Leiper Manufg. Co.
Lancaster	S. S. Spencer	Conestoga Steam Mills.
Mt. Joy	Thomas J. Brown	George Brown's Sons.
Philadelphia	Robert Beatty	Coral and Adams Sts.
Philadelphia	T. Ashby Blythe	Ashby Cotton Mills.
Philadelphia	Alfred H. Burnham	Glasgow Mills.
Philadelphia	Harry W. Butterworth	York and Cedar Sts.
Philadelphia	James Butterworth	York and Cedar Sts.
Philadelphia	Frederick A. Downes	Factory Mutual Fire Insurance Co.
Philadelphia	Edward W. France	Philadelphia Textile School.
Philadelphia	Merrill A. Furbush	2015 North 33rd St.
Philadelphia	Joshua Garsed	Wingohocking Mills and National Spinning Co., Frankford.
Philadelphia	John T. Greenwood	R. Greenwood & Bault.
Philadelphia	Henry S. Grove	Argo Mills Co.
Philadelphia	W. C. Houston	Hope Mills Mfg. Co.
Philadelphia	John H. Lorimer	Ontario and Lawrence Sts.
Philadelphia	David Milne	Washington Ave. and 11th St.
Philadelphia	Edward H. Sanborn	Cold Spring Bleach. & Fin. Works.
Philadelphia	Theodore C. Search	Cold Spring Bleach. & Fin. Works.
Philadelphia	George Wood	Millville Mfg. Co.
Philadelphia	John P. Wood	Spring Garden and 22nd Sts.
Philadelphia	Oscar W. Wood	Germantown Spinning Co.

DELAWARE.

Wilmington	William P. Bancroft	Joseph Bancroft & Sons Co.
Wilmington	Daniel Moore Bates	Joseph Bancroft & Sons Co.
Wilmington	Charles F. Farrar	Delaware Cotton Co.

MARYLAND.

Baltimore	James A. Gary	Alberton Mills.
Baltimore	Charles K. Oliver	Mt. Vernon Woodberry Cot. Duck Co.
Ilchester	Samuel F. Patterson	Thistle Mills Co.

VIRGINIA.

Lynchburg	Theop. W. Wilmarth	Lynchburg Cotton Mill Co.

NORTH CAROLINA.

Charlotte	S. B. Alexander, Jr.	S. B. Alexander, Jr., Co.
Charlotte	Henry C. Clark	Charlotte Supply Co.
Charlotte	R. M. Miller, Jr.	Elizabeth Mills.
Charlotte	D. A. Tompkins	D. A. Tompkins Co.
Charlotte	J. P. Wilson	Dover Yarn Mills.
Durham	O. W. Stites	Commonwealth Cotton Mfg. Co.
Fayetteville	Walter L. Holt	Holt-Morgan Mills.
Greensboro	Caesar Cone	Proximity Mfg. Co.
Greensboro	Edward T. Garsed	Hucomuga Mills.
Hope Mills	Frank H. Cotton	Hope Mills Mfg. Co.
Kings Mountain	F. Dilling	Dilling Cotton Mills.
Lincolnton	R. S. Reinhardt	Elm Grove Cotton Mills.
Mountain Island	W. T. Jordan	Mt. Island Manufg. Co.
Winston-Salem	John W. Fries	F. & H. Fries.

SOUTH CAROLINA.

Charleston	J. Colby Lewis	Vesta Cotton Mills.
Chester	William G. Nichols	Springstein Mills.
Columbia	James Sumter Moore	Olympia & Richland Cotton Mills.
Columbia	W. H. Rose	Granby Cotton Mills.
Columbia	W. B. Smith Whaley	Richland & Granby Cotton Mills.
Gaffney	H. D. Wheat	Gaffney Manufg. Co.
Gaffney	Edward B. Wilbur	Gaffney Mfg. Co.
Graniteville	T. H. Rennie	Graniteville Mfg. Co.
Lancaster	Leroy Springs	Lancaster Cotton Mills.
Langley	Arthur T. Smith	Langley Manufg. Co. and Aiken Manufg. Co.
Orangeburg	Samuel Dibble	The Enterprise Cotton Mills.
Pelham	D. G. Sunderland	The Pelham Mills.
Pelzer	B. F. Guy	Pelzer Manufg. Co.
Pelzer	Ellison A. Smyth	Pelzer Manufg. Co.
Union	T. C. Duncan	Union Cotton Mills.

GEORGIA.

Atlanta	C. E. W. Dow	Am. Moist. Co. and Wm. Firth Co.
Atlanta	W. L. Draper	Dodge Mfg. Co.
Atlanta	Oscar Elsas	Fulton Bag and Cotton Mills.
Atlanta	Henry E. Fisher	Atlanta Cotton Mills.
Atlanta	D. E. McGaw	Supply Dept., Southern Belting Co.
Atlanta	William M. Nixon	Atlanta Woolen Mills.
Atlanta	James R. Pearce	Fulton Bag and Cotton Mills.
Augusta	Thomas Barrett, Jr.	Langley & Aiken Mills.
Augusta	John W. Chafee	The Sibley Mfg. Co.
Augusta	Charles Estes	John P. King Mfg. Co.
Augusta	Arthur C. Freeman	Box 208
Augusta	T. I. Hickman	Graniteville Mfg. Co.
Augusta	Otis G. Lynch	Enterprise Manufg. Co.
Augusta	Joel Smith	J. P. King Mfg. Co.
Augusta	George R. Stearns	Riverside Mills.
Augusta	Eugene F. Verdery	Warren Mfg. Co.
Augusta	James P. Verdery	Enterprise Mfg. Co.
Chattahoochee	W. R. B. Whittier	Whittier Mills.
Columbus	E. N. Clemence	Eagle & Phenix Mills.
Columbus	Frederick B. Gordon	Columbus Mfg. Co.
Columbus	Charles H. Gorton	Columbus Mfg. Co.
Columbus	George W. Towne	Columbus Power Co.
East Point	Edward C. Beach	Gate City Cotton Mills.
Griffin, Spalding Co.	Albert G. Martin	Kincaid Manufg. Co.
Lindale	Henry P. Meikleham	Mass. Mills in Georgia.
Macon	W. H. Richmond	Bibb Mill No. 2.
Macon	Broadus E. Willingham	Willingham Cotton Mills.

TENNESSEE.

Knoxville	William T. Lang	Brookside Mills.
Memphis	C. C. Cowan	372 Front St.
Memphis	Jerome Hill	Tennessee Planters' Co.
Nashville	T. B. Dallas	Phoenix Cotton Mills, and Dallas Mfg. Company.

MISSISSIPPI.

Agricultural College,	Arthur Whittam	Miss. Agricultural and Mechanical College.

LOUISIANA.

New Orleans	S. Odenheimer	Lane Mills.

KENTUCKY.

Henderson	Paul J. Marrs	Henderson Cotton Mills.
Louisville	Philip S. Tuley	Louisville Cotton Mills Co.

ALABAMA.

Birmingham	B. B. Comer	Avondale Cotton Mills.
Cordova	Joseph O. Hannum	Indian Head Mills of Ala.
Huntsville	T. W. Pratt	West Huntsville Cotton Mill Co.
Langdale	Charles M. Sears	West Point Mfg. Co.

TEXAS.

Galveston	Lawrence V. Elder	Galveston City Cotton Mills.

CANADA.

Province of Ontario.

Hamilton, Ont.	Charles Owen Dexter	The Canadian Colored Cotton Mills Co., Ltd.
Cornwall	S. Greenwood	The Canadian Colored Cotton Mills Co. Ltd.
Hamilton, Ont.	James M. Young	Hamilton Cotton Co.
Ottawa	Louis Simpson	Victoria Chambers.

Province of Quebec.

Hochelaga, P. Q.	W. S. Hume	176 Notre Dame St.
Montreal, P. Q.	Alfred Hawkesworth	Merchants Cotton Co.
Montreal, P. Q.	Fred Hawkesworth	Merchants Cotton Co.
Montreal, P. Q.	D. K. McLaren	751 Craig St.
Valleyfield, P. Q.	Ernest E. Clark	Montreal Cotton Co.
Valleyfield, P. Q.	Fred Lacey	Montreal Cotton Co.
Valleyfield, P. Q.	Charles H. Potter	Montreal Cotton Co.

NEW BRUNSWICK.

Marysville	John B. Cudlip	Gibson Cotton Mill.
Milltown	Lewis Dexter, Jr.	The Canadian Colored Cotton Mills Co., Ltd.
Milltown	Farquharson J. Muir	The Canadian Colored Cotton Mill. Co., Ltd.
St. John	John H. Parks	Wm. Parks & Son, Ltd.

ENGLAND.

Matlock, Derbyshire,	John Edward Lawton	American Thread Co.
Huddersfield	John Sykes	English Card Clothing Co.

RECAPITULATION.

LOCATION OF MEMBERSHIP.

Maine	20
New Hampshire	30
Vermont	1
Massachusetts	304
Rhode Island	115
Connecticut	27
New York	23
New Jersey	11
Pennsylvania	23
Delaware	3
Maryland	3
Virginia	1
North Carolina	14
South Carolina	15
Georgia	27
Tennessee	4
Mississippi	1
Louisiana	1
Kentucky	2
Alabama	4
Texas	1
Province of Ontario	4
Province of Quebec	7
New Brunswick	4
England	2
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IN MEMORIAM.

B. ADELBERT ALEXANDER.

B. ADELBERT ALEXANDER, late superintendent of the Boston Duck Co., at Bondsville, Mass., who died at Rockland, Me., Sept. 14, 1900, was born at North Haven, Me., June 7, 1855. Early in his boyhood he removed to Norwich, Conn., and received his education in the schools of that city.

At the age of seventeen he took charge of the finishing and packing room of the Shetucket Co., under the late R. H. PLUMMER, superintendent, which position he held until 1895, when he went to Slatersville, R. I., where he assumed a position as overseer of the finishing room of the W. A. Slater Mills Corporation. In 1898 he became superintendent of the Boston Duck Co., which position he held at the time of his death.

The cause of Mr. ALEXANDER'S death was typhoid fever and he was ill only a short time. He had partially recovered and went to Rockland hoping the change would afford him some relief. He was taken worse, however, and the end came suddenly. He was a member of Somerset Lodge, No. 34, F. and A. M., of Norwich. He became a member of the New England Cotton Manufacturers' Association April 28, 1898.

He leaves besides his wife, two daughters, BESSIE and ROSE ALEXANDER. Interment was at Norwich.

JOHN WATERMAN.

JOHN WATERMAN, treasurer and agent of the Warren Manufacturing Co., Warren, R. I., died of apoplexy December 21, 1900. He was born at Warren in 1852 and was educated in the public schools of that town, in which he had devoted all his business interests. In 1881 he succeeded his father, JOHN O. WATERMAN, in the management of the mills in which he had received a practical training in all grades of the work. He was president of two and a director in the third of the four banking institutions in the town and was also on the boards of banks and insurance companies in Providence.

He was a colonel in the militia and past master of the Washington Lodge of Masons.

He was affiliated with St. Mark's Church, where he has been a vestry-man for twenty-four years and junior warden for eleven years, giving great interest to the Sunday School and the choir of the church.

He was married in 1884 to Miss SARAH F. ADAMS and left a family of six children.

He was a man of sterling character and great energy and in the many trusts which were placed upon him was noted for his sense of justice.

He became a member of the New England Cotton Manufacturers' Association April 30, 1884.

CHARLES LANGDON BAILEY.

CHARLES LANGDON BAILEY was born in Bartlett, N. H., August 11, 1842. He died at his home in Waltham, Mass., Dec. 28, 1900.

His early business training was received in the Amoskeag

Manufacturing Co. of Manchester, N. H. From there he went to Suncook, N. H., as overseer of the carding department of the China Mills. Later he accepted a similar position at Shirley, Mass., which position he held until 1874, resigning to accept a position in the Boston Manufacturing Co. of Waltham, Mass. He entered the employment of that company as overseer of the carding department and subsequently held a similar position over the hosiery department. Later he was made superintendent of the cotton mills there, which position he resigned in January, 1900, owing to failing health.

Mr. BAILEY served on the Waltham school board for two terms of three years each, being elected in 1887 and re-elected in 1890. He also served several years on the board of health and for a time was a member of the Waltham Republican town committee.

During the civil war he served with the First New Hampshire Heavy Artillery as first lieutenant.

He was a member of Monitor Lodge of Masons, Waltham, Royal Arch Chapter, Gethsemane Commandery, K. T., Waltham Lodge of Good Fellows and F. P. H. Rogers Post, G. A. R.

He leaves a widow and two children, a son and daughter.

He became a member of the New England Cotton Manufacturers' Association September 27, 1894.

JONES S. DAVIS.

JONES S. DAVIS died at Holyoke, Mass., on Feb. 1, 1901, at the age of 83. He was a native of Athol, Mass., where he began work in the cotton mills. In 1840 he entered the Lyman Mills at Holyoke and rose to be agent of that corporation, holding the position for twenty years. During this time he visited European mills and introduced many of the improved methods which he found abroad.

He took a very active part in public affairs at Holyoke and was a strong factor in the development of the interests of that city.

He was fond of association with men and organized the Hampden County Spinners' Association and when there was need of extending the scope of that organization, formed, with his associates, this Association, into which the earlier organization was merged.

He was made an honorary member of the Association Oct. 27, 1897, and appreciated this testimonial from his former associates and their successsors.

In his later life, he was much interested in the possibilities of the manufacture of flax in New England, believing that it afforded a good opportunity for the investment of capital to take the place of the coarser cottons of New England, and read a paper on the subject at the sixty-fourth meeting of the Association at Boston, April 27, 1898.

JAMES GILBERT HILL.

Capt. JAMES GILBERT HILL died at Lowell, Mass., Apr. 4, 1901. He was born in Albany, N. Y., in 1841 and began in the cotton mills at Ware and Chicopee and was superintendent of the Thorndike Mills in 1869.

When the civil war broke out he enlisted in the 31st Massachusetts regiment and was afterwards transferred to the 42nd, becoming first lieutenant in the engineering corps and afterwards receiving the commission of captain.

In 1871 he became superintendent of the Lawrence Manufacturing Co. of Lowell and retired in 1897, since which time he was consulting engineer, devoting much of his time as an expert witness in connection with litigation in regard to mills.

He was a member of the Military Order of the Loyal Legion,

trustee of the Mechanics' Savings Bank and was for several terms president of the Old Middlesex Mechanics' Association.

He left a widow, three sons and a daughter.

He became a member of the New England Cotton Manufacturers' Association Jan. 15, 1868.

PROCEEDINGS.

In accordance with the legal notice, the stated annual meeting of the Association was held in Chipman Hall, Boston, Mass., April 24th and 25th, 1901. The following 193 members and 105 guests were present.

ACTIVE MEMBERS.

ALFRED E. ADAMS, Whitinsville, Mass.
JOSEPH D. AIKEN, Taftville, Conn.
THOMAS ARMSTRONG, North Pownal, Vt.
NATHANIEL M. AYER, Boston, Mass.
EDWARD R. BALLOU, Providence, R. I.
LOUIS B. BARKER, Central Falls, R. I.
EDWIN N. BARTLETT, North Oxford, Mass.
JOSEPH P. BATTLES, Lewiston, Me.
GEORGE W. BEAN, Lewiston, Me.
ROBERT BEATTY, Philadelphia, Pa.
RICHARD B. BORDEN, Fall River, Mass.
CHRISTOPHER P. BROOKS, New Bedford, Mass.
ROBERT BURGESS, New Bedford, Mass.
EDWARD N. BURKE, Lowell, Mass.
CLARENCE N. CHILDS, Lowell, Mass.
JNO. H. C. CHURCH, Great Barrington, Mass.
B. B. COMER, Birmingham, Ala.
FRANK B. COMINS, Boston, Mass.
WILLIAM J. CRAY, Moosup, Conn.
P. T. CREED, Taunton, Mass.
WOODBURY K. DANA, Westbrook, Me.

CHARLES W. DENNETT, North Adams, Mass.
EDWARD P. DENNIS, Lowell, Mass.
CHARLES A. DENNY, Leicester, Mass.
P. Y. DE NORMANDIE, Boston, Mass.
ALBERT W. DIMICK, Fisherville, Mass.
GEORGE OTIS DRAPER, Hopedale, Mass.
RUSSELL W. EATON, Brunswick, Me.
JOHN ECCLES, Taftville, Conn.
FREDERICK W. ELY, Greenville, N. H.
JAMES T. FERGUSON, Lowell, Mass.
CHARLES H. FISH, Dover, N. H.
HERBERT FISHER, Taunton, Mass.
WILLIAM B. FITTZ, Easthampton, Mass.
FREDERICK A. FLATHER, Lowell, Mass.
M. F. FOSTER, Milford, N. H.
C. H. FRISBIE, Norwich, Conn.
CHARLES E. GETCHELL, Waltham, Mass.
ALFRED M. GOODALE, Boston, Mass.
MARCELLUS GOULD, Penacook, N. H.
GEORGE P. GRANT, Jr., Fitchburg, Mass.
D. W. GRAY, Utica, N. Y.
R. A. GRAY, Allenton, R. I.
JOHN GREGSON, Fiskdale, Mass.
DAVID GROVE, Central Falls, R. I.
ARTHUR H. GULLIVER, Waltham, Mass.
FRANK J. HALE, Newton Upper Falls, Mass.
JOHN F. HAMLET, Fall River, Mass.
HENRY F. HARRIS, Worcester, Mass.
ALFRED HAWKESWORTH, Montreal, P. Q.
FRED HAWKESWORTH, Montreal, P. Q.
WILLIAM R. HILL, South Hadley Falls, Mass.
CHARLES H. HOBBS, Thorndike, Mass.
FRANKLIN W. HOBBS, Boston, Mass.
CHARLES M. HOLMES, Manchaug, Mass.
GEORGE W. HOLT, Putnam, Conn.
DAVID S. JOHNSTON, Cohoes, N. Y.
JOHN KILBURN, Belmont, Mass.
HARRY W. KIMBALL, Bath, Me.
JESSE A. KNIGHT, Providence, R. I.

STEPHEN A. KNIGHT, Providence, R. I.
FRED LACEY, Valleyfield, P. Q.
EVAN ARTHUR LEIGH, Boston, Mass.
J. COLBY LEWIS, Charleston, S. C.
ARTHUR H. LOWE, Fitchburg, Mass.
WILLIAM L. LYALL, Passaic, N. J.
FREDERICK B. MACY, New Bedford, Mass.
CHARLES R. MAKEPEACE, Providence, R. I.
CHARLES H. MANNING, Manchester, N. H.
HENRY F. MANSFIELD, Utica, N. Y.
HENRY D. MARTIN, Newry, S. C.
THOMAS MAYOR, Providence, R. I.
CHARLES D. MCDUFFIE, Manchester, N. H.
WILLIAM P. MCMULLAN, Salem, Mass.
W. H. MILES, Lisbon, Me.
EDWARD A. MONGEON, Lonsdale, R. I.
J. R. MONTGOMERY, Windsor Locks, Conn.
FRED W. MOORE, Millbury, Mass.
ALBERT H. MORTON, Lowell, Mass.
FARQUHARSON J. MUIR, Milltown, N. B.
HENRY OSGOOD, Jewett City, Conn.
WALTER E. PARKER, Lawrence, Mass.
WILLIAM C. PEIRCE, Providence, R. I.
HAVEN C. PERHAM, Lowell, Mass.
ALBERT R. PIERCE, New Bedford, Mass.
JOSEPH H. POTTER, Jr., Fall River, Mass.
J. F. POWERS, North Adams, Mass.
HERBERT L. PRATT, Lewiston, Me.
JOHN E. PREST, Cohoes, N. Y.
M. W. QUINN, Amesbury, Mass.
T. G. RAMSDELL, Housatonic, Mass.
T. H. RENNIE, Graniteville, S. C.
WALTER RIGBY, Providence, R. I.
BENJ. H. ROBERTS, Fall River, Mass.
CHARLES D. ROBINSON, Crompton, R. I.
EDWIN A. ROBINSON, Lowell, Mass.
ARNOLD B. SANFORD, Boston, Mass.
THOMAS C. SHELDON, Fitchburg, Mass.
WILLIAM F. SHERMAN, Boston, Mass.

HERBERT H. SHUMWAY, Taunton, Mass.
J. C. SMITH, Fall River, Mass.
THOMAS HENRY SMITH, Jamestown, N. Y.
GEORGE E. SPOFFORD, Blackstone, Mass.
T. B. STEVENSON, Hyde Park, Mass.
ROBERT STEWART, Ashton, R. I.
JOHN SULLIVAN, Fall River, Mass.
WALTER H. SUMMERSBY, Pontiac, R. I.
JAMES W. TAYLOR, Taunton, Mass.
EDWARD W. THOMAS, Lowell, Mass.
D. M. THOMPSON, Providence, R. I.
JOSEPH S. TIDD, Taunton, Mass.
JAMES P. TOLMAN, Boston, Mass.
C. H. TRUESDELL, Killingly, Ct.
OSCAR B. TRUESDELL, Newtonville, Mass.
HERBERT E. WALMSLEY, New Bedford, Mass.
FREDERICK T. WALSH, Boston, Mass.
JOSEPH WATTERS, Fall River, Mass.
F. E. WATTLES, Penacook, N. H.
JOSEPH W. WATTLES, Canton Junction, Mass.
GEORGE W. WEEKS, Clinton, Mass.
W. B. SMITH WHALEY, Columbia, S. C.
CHANNING WHITAKER, Lowell, Mass.
A. TENNY WHITE, Manville, R. I.
ALFRED N. WHITING, Worcester, Mass.
WILLIAM WHITTAM, Jr., Woonsocket, R. I.
BENJAMIN WILCOX, New Bedford, Mass.
JOHN B. WILD, Utica, N. Y.
BROADUS E. WILLINGHAM, Macon, Ga.
C. J. H. WOODBURY, Lynn, Mass.

ASSOCIATE MEMBERS.

EUGENE C. ANDRES, Boston, Mass.
H. B. ASHTON, Medford, Mass.
HENRY ASHWORTH, Fall River, Mass.
FRANK P. BENNETT, Boston, Mass.
J. FRANK BRAIDS, Providence, R. I.
HENRY G. BRINCKERHOFF, Boston, Mass.

D. Russell Brown, Providence, R. I.
H. Martin Brown, Providence, R. I.
John H. Burghardt, Boston, Mass.
Eugene E. Burnham, Lawrence, Mass.
Harry W. Butterworth, Philadelaphia, Pa.
Malcolm Campbell, Woonsocket, R. I.
W. W. Carey, Lowell, Mass.
Thomas G. Cox, Taunton, Mass.
Joseph L. Cushing, Lowell, Mass.
Frederick I. Dana, Providence, R. I.
C. E. W. Dow, Atlanta, Ga.
John O. DeWolf, Boston, Mass.
Fred W. Easton, Pawtucket, R. I.
G. B. Emmons, Lawrence, Mass.
John T. Fyans, Fall River, Mass.
H. P. Garland, Biddeford, Me.
Royal W. Gates, Lowell, Mass.
Sumner S. Gould, Lowell, Mass.
William S. Granger, Providence, R. I.
Arthur F. Gray, Boston, Mass.
Alfred H. Hartley, Fall River, Mass.
Richard H. Hill, Boston, Mass.
David Jackson, Pawtucket, R. I.
James H. Kendall, Cambridgeport, Mass.
John E. Kendrick, Providence, R. I.
Frank B. Kenney, Lowell, Mass.
W. C. Langford. Providence, R. I.
Samuel D. Lawton, Fall River, Mass.
Stephen C. Lowe, Boston, Mass.
John McCullough, New Bedford, Mass.
H. G. McKerrow, Boston, Mass.
D. K. McLaren, Montreal, P. Q.
Charles B. Moore, Boston, Mass.
George B. Morison, Boston, Mass.
John H. Nelson, Boston, Mass.
William R. Noone, Boston, Mass.
Sidney B. Paine, Boston, Mass.
Arthur Parkinson, New York, N. Y.
Charles A. M. Praray, Providence, R. I.
E. R. Richardson, Pawtucket, R. I.

C. E. ROBERTS, Boston, Mass.
GEORGE I. ROCKWOOD, Worcester, Mass.
E. A. RUSDEN, Warren, R. I.
JOHN M. RUSSELL, Worcester, Mass.
DWIGHT SEABURY, Pawtucket, R. I.
JOHN E. SEARLES, New York, N. Y.
J. FOSTER SEARLES, Readville, Mass.
HARRY M. SMITH, Providence, R. I.
HENRY C. SPENCE, Indian Orchard, Mass.
GEORGE W. STAFFORD, Providence, R. I.
H. E. STAFFORD, Providence, R. I.
CYRUS A. TAFT, Whitinsville, Mass.
JAMES T. THORNTON, Providence, R. I.
JUSTIN A. WARE, Worcester, Mass.
LETTICE R. WASHBURN, New Bedford, Mass.
W. W. WHITE, Worcester, Mass.
FRED A. WILDE, Pawtucket, R. I.
ERVING YALE WOOLLEY, Boston, Mass.

GUESTS.

A. A. ASPINWALL, Pawtucket, R. I.
E. E. AUSTIN, Providence, R. I.
W. W. BALLAGH, New York, N. Y.
J. W. BALLARD, Boston, Mass.
H. G. BEEDE, Pawtucket, R. I.
E. E. BLAKE, Newton Highlands, Mass.
FRANCIS H. BOYER, Somerville, Mass.
J. A. BROCK, Anderson, S. C.
MILTON B. BROWN, Providence, R. I.
D. W. BUGBEE, Lowell, Mass.
C. F. BURNHAM, Saylesville, R. I.
F. H. BURT, Boston, Mass.
L. W. CAMPBELL, Woonsocket, R. I.
F. A. CHASE, Boston, Mass.
C. M. CLAREY, Boston, Mass.
W. A. CLARK, Columbia, S. C.
C. E. CHILDS, Northampton, Mass.
HENRY W. CHURCH, Lowell, Mass.
M. H. COFFIN, Whitinsville, Mass.

J. A. Cooper, Whitinsville, Mass.
W. P. Cotharin, Boston, Mass.
W. J. Curit, Boston, Mass.
E. W. Davenport, Providence, R. I.
J. J. DeLong, New York, N. Y.
W. J. Denny, Lowell, Mass.
Nathaniel Dike, Boston, Mass.
Thomas B. Doolittle, Boston, Mass.
E. C. Doyle, Cohoes, N. Y.
H. C. Eccles, Charlotte, N. C.
L. C. Farnsworth, Providence, R. I.
J. C. Farwell, Boston, Mass.
L. M. Foss, Lowell, Mass.
E. T. Fowler, Westfield, Mass.
C. E. Gile, Providence, R. I.
J. Goff, Charlotte, N. C.
W. H. Harris, Charlotte, N. C.
W. C. Harrison, Boston, Mass.
Hon. Thomas N. Hart, Boston, Mass.
Walter J. Hartford, Saylesville, R. I.
J. F. Harvey, Boston, Mass.
M. A. Hays, Boston, Mass.
A. D. Hitchings, Saugus, Mass.
B. F. Howe, Shirley, Mass.
L. R. Howe, Boston, Mass.
Daniel Jackson, Providence, R. I.
James B. Jones, Philadelphia, Pa.
A. S. Kellogg, Boston, Mass.
A. O. Kittredge, New York, N. Y.
Henry G. Kittredge, Boston, Mass.
Walter L. Lane, Boston, Mass.
A. C. Larkin, Boston, Mass.
L. A. Lockwood, Saylesville, R. I.
R. W. MacAllster, Cohasset, Mass.
Louis B. Magid, Milford, Mass.
B. S. D. Marden, Providence, R. I.
C. F. Marden, Boston, Mass.
John W. Mayor, Providence, R. I.
Hans Meinl, Vienna, Austria.
John S. Merchant, Providence, R. I.

E. L. MERROW, Providence, R. I.
C. L. MESSENGER, Boston, Mass.
J. J. MITCHELL, Jr., Boston, Mass.
J. A. MITSCH, Boston, Mass.
E. H. MULLIN, New York, N. Y.
JAMES MURKLAND, Lowell, Mass.
FRANK L. NAGLE, Boston, Mass.
W. C. NAIRN, North Cambridge, Mass.
EDMUND NOBLE, Boston, Mass.
A. W. NOONE, Peterboro, N. H.
C. H. NOONE, Dorchester, Mass.
FRED OTT, Pawtucket, R. I.
S. S. PAINE, Newton, Mass.
B. P. PALMER, Boston, Mass.
C. W. PIERCE, Charlotte, N. C.
HENRY SMITH PRITCHETT, Boston, Mass.
A. F. RAY, Boston, Mass.
H. L. REYNOLDS, Lowell, Mass.
J. P. REYNOLDS, Boston, Mass.
EDWARD F. RICE, Lawrence, Mass.
WILLIAM R. RONEY, New York, N. Y.
L. H. A. SCHWARTZ, New Bedford, Mass.
GEORGE H. SHERMAN, Worcester, Mass.
L. T. SHURTLEFF, New Bedford, Mass.
CHARLES T. SLACK, Fall River, Mass.
A. D. SMITH, New Bedford, Mass.
E. C. SMITH, Providence, R. I.
H. C. SPAULDING, Boston, Mass.
ANTONIO SPENCER, Providence, R. I.
G. F. STEELE, Boston, Mass.
H. STEPHENSON, Boston, Mass.
L. B. SWATT, Woonsocket, R. I.
F. S. SWEET, Providence, R. I.
R. W. SWIFT, Boston, Mass.
C. A. TABOR, Thorndike, Mass.
RODNEY THAYER, Boston, Mass.
E. B. TOWNSEND, Lowell, Mass.
F. G. TRUNKETT, Boston, Mass.
GEORGE F. TUCKER, New Bedford, Mass.
C. M. WHEATON, Boston, Mass.

J. D. WHITTAKER, Boston, Mass.
Dr. L. WHITE, Natick, Mass.
WILLIAM WHITE, North Adams, Mass.
OROSCO C. WOOLSON, New York, N. Y.
A. WOODBURY, Boston, Mass.
G. H. WORALL, Laconia, N. H.

FIRST SESSION.

CHIPMAN HALL, BOSTON, MASS.,
Wednesday, April 24, 1901.

The meeting called to order at 11 A. M., President D. M. THOMPSON in the chair.

The Secretary read the following call to the meeting:

BOSTON, MASS., April 3, 1901.

To the Members:—

Notice is hereby given that the stated Annual Meeting of this Association will be held at Boston, Mass., Wednesday and Thursday, April 24 and 25, 1901.

The sessions will be held in Chipman Hall, in the Tremont Temple, No. 88 Tremont Street, a short distance south of School Street, and opposite the Tremont Building. The entrance is at No. 88 Tremont Street, and Chipman Hall is on the sixth floor, reached by elevators.

The sessions will be called to order on Wednesday at 11 A. M., and 2 P. M., and on Thursday at 10 A. M., and 2 P. M.

By order of the Board of Government,

C. J. H. WOODBURY,
Secretary.

The opening address will be made by HENRY SMITH PRITCHETT, Ph. D., LL. D., President of the Massachusetts Institute of Technology; and the Board of Government especially hope that at this meeting the various papers will receive a full discussion and that inability to attend the meeting may not be considered by anyone an impediment, as discussions may be written and sent to the Secretary to be read. For the purpose of furnishing better facilities for a discussion, the papers are to be printed in advance, if the manuscripts are received in time by the Secretary, and copies of such papers will be sent on request to any members five days before the meeting.

The full programme will not be issued until the meeting, but papers are expected on the following subjects:

Industrial Unity.
Cotton Mill Accounting.
The Cloth Room; Its Arrangements and Needs.
Cotton Manufacturing in Japan.
A Modern Textile Machine Plant.
Overseeing.
Possible Additional Economies at the Steam End of the Mill.
Friction Clutches in Cotton Mills.
Mechanical Transmission of Power.
Some of the Troubles to Manufacturers Arising from Dyed Yarns.
Water Cooling Towers.
Cotton Manufacturing in Mexico.
A Little Study in Lug Straps for Broad Drop Box Looms.
The Results of Artificial Humidity in Cotton Manufacturing.
The Paris Congress on Unification of Yarn Numbering.

The New England Telephone & Telegraph Co. will place two telephone booths in the corridor outside of the hall for the free use of the members for Boston and vicinity during the day, and before 10.00 A. M. and after 4.00 P. M. free telephone service over the states of Maine, New Hampshire, Vermont and Massachusetts. The American Telephone and Telegraph Co. will give free long distance service to members beyond this territory before 10.00 A. M. and after 6.00 P. M. In this, as in all the other privileges of the Association, candidates for membership will receive the same privileges as the members.

The souvenir badges will be given to those members who are in attendance, and the Board of Government has given instructions that duplicates shall not be given until after the adjournment, but other souvenir badges will be given to the guests of members.

It is desired that applications for membership shall be received as far as possible in advance of the meetings. Blank propositions are enclosed herewith and may be found on the inside cover of the Transactions, or will be sent on application.

Members who have overlooked their postal card receipts for Transactions are requested to give the matter attention, as it is only through this means that the headquarters of the Association are able to know that members receive the volumes and notices to which they are entitled.

The SECRETARY. Mr. President, in accordance with Article 14 of the by-laws, I certify that a copy of this notice was mailed to each member at least ten days in advance of this meeting, and that a quorum is now present.

The notice was sent to members in full, and the programme is as follows:

PROGRAMME, ANNUAL MEETING, No. 70.

CHIPMAN HALL, 88 TREMONT STREET, BOSTON, MASS., APRIL 24-25, 1901.

First Session, Wednesday, April 24, 1901, at 11 A. M.

Call to Order.

Election of Officers.

Welcome to the Association.

HIS HONOR, THOMAS N. HART, Mayor of the City of Boston.

Address — Is There a Place for a Profession in Commerce?

HENRY SMITH PRITCHETT, Ph. D., LL. D., President Massachusetts Institute of Technology.

President's Address.

D. M. THOMPSON, Providence, R. I.

Report of the Secretary and Treasurer.

Second Session, Wednesday, April 24, 1901, at 2 P. M.

A Modern Textile Machine Building Plant.
[Illustrated by the Stereopticon.]
H. G. McKERROW, Boston, Mass.

Accounting for Cotton Mills.
A. O. KITTREDGE, 25 Pine Street, New York, N. Y.

Humidifiers in Cotton Mills.
C. E. W. Dow, Atlanta, Ga.

Friction Clutches in Cotton Mills and the Philips Clutch.
THOMAS HENRY SMITH, Jamestown, N. Y.

Third Session, Thursday, April 25, 1901, at 10 A. M.

Industrial Unity.
HERBERT E. WALMSLEY, New Bedford, Mass.

Possible Additional Economies at the Steam End of the Mill.
OROSCO C. WOOLSON, 26 Cortlandt Street, New York, N. Y.

Water Cooling Towers and Positive Steam and Oil Separating.
FRANCIS H. BOYER, Somerville, Mass.

The Cloth Room; Its Arrangements and Needs.
ARTHUR F. GRAY, Boston, Mass.

Fourth Session, Thursday, April 25, 1901, at 2 P. M.

Election of Members.

Report of the International Congress for the Unification of the Numbering of Yarn. Held at Paris, Sept. 3-4, 1900.
Translated by the Secretary.

Overseers and Overseeing.
CHARLES W. DENNETT, North Adams, Mass.

Some of the Troubles to Manufacturers Arising from Dyed Yarns.
FARQUHARSON J. MUIR, Milltown, N. B.

A Little Study in Lug Straps for Broad Drop Box Looms.
FRANK P. VOGL, Claremont, N. H.

The telephone booths in the corridor are placed by the New England Telephone and Telegraph Company for the free use of the members for Boston and vicinity during the day, and before 10.00 A. M. and after 4.00 P. M. free telephone service over the states of Maine, New Hampshire, Vermont and Massachusetts.

At these booths the American Telephone and Telegraph Company give free long distance service to members beyond this territory before 10.00 A. M. and after 6.00 P. M.

In this, as in all the other privileges of the Association, candidates for membership will receive the same privileges as the members.

The souvenir badges will be given to those members who are in attendance, and the Board of Government has given instructions that duplicates shall not be given until after the adjournment, but other souvenir badges will be given to the guests of members.

A limited number of tickets, each admitting the bearer with friends, including ladies, to the Sixty-fourth Exhibition of Paintings at the Boston Art Club, Corner of Dartmouth and Newbury streets, open from 9.00 A. M. to 10.00 P. M., may be obtained from the Secretary.

Through the courtesy of Mr. H. C. SPAULDING of the American Stoker Company, the members and guests are invited on a trip to the United States Navy Yard at Charlestown, starting from Scollay Square at the head of Brattle Street on special cars which will leave at 4 P. M., Thursday, April 25. Special tickets may be obtained from the register clerk at Chipman Hall.

Rear Admiral W. T. SAMPSON, U. S. N., Commandant of the Navy Yard, has given permission for the party to visit the *Olympia* and other points of public interest.

The records of the last meeting were read by the Secretary, and on motion of Mr. GEORGE OTIS DRAPER, seconded by Mr. ARTHUR H. LOWE, the same were accepted.

The PRESIDENT. The next business in order is the election of officers. I will announce the appointment of Messrs. GEORGE OTIS DRAPER, HERBERT L. PRATT, J. H. BURGHARDT, JOSEPH P. BATTLES and WALTER E. PARKER as a committee for the nomination of officers for the ensuing year.

Members of the Association: Boston is fortunate in having a Mayor who is especially well equipped through broad business experience in both civic and mercantile affairs as a preparation for attending to the vast interests of the metropolis under his charge. There is a possible kinship which gives him an affiliation with this organization, for his long and prosperous business career has been devoted to the only garments made without a spinner or a weaver, except as to the linings. We must, therefore, speculate or draw upon our imagination as to whether there may have been any relationship with the products of the works of the membership of this Association in that particular, but in these days of mercerized yarns there are possibly cotton goods which may be commended to his respectful attention. I have, gentlemen, the honor and exceeding pleasure of presenting to you this morning His Honor, THOMAS N. HART, Mayor of the city of Boston. [Applause.]

Hon. THOMAS N. HART. Mr. President, gentlemen, it is a pleasant duty that the Mayor of Boston has occasionally to welcome organizations like this to the city of Boston. We are glad that you are here and we hope that you may receive some profit from the visit. We wish you might have come under more pleasant auspices, but we have not seen the sun here ourselves but two days in the last thirty. But, barring all that, we will make it a pleasant time for you. We will light up with the electric lights and we will give you good cheer wherever you may be.

And now the duty of the Mayor of Boston is about done. He comes here to welcome you and to say that so far as the city of Boston is concerned, anything that the manufacturers of New England may demand, we will be glad to give. We look upon Boston as the capital of New England. You are the manufacturers of New England, and here you gather in the capital. We wish you all prosperity. The work that we have done as New England men reaches out far beyond our borders. When we say we are of Boston and Massachusetts and New England, it

means pretty nearly the whole country, for whatever good thing you may find in almost any direction, either in manufactures, in education or in religion, first started from New England. I bid you God-speed in your work. [Applause.]

The PRESIDENT. Gentlemen, next in order is an address which will surely be of great interest to you. Recent events indicate that Washington University of St. Louis might, like Virginia, well bear the title of " Mother of Presidents ", from the fact that several of its professors have been called from there to the presidency of other institutions of learning. Its professor of astronomy in his later position as the head of the United States Coast Survey established the rare combination of the scholar and the man of executive affairs; and it was particularly appropriate that his calling in providing conditions of greater safety from the dangers of our coast should be preliminary to his present position in guiding young men, more precious than the argosies of the Orient, over the hazards of life to enable them to safely conduct their own careers in channels of greatest usefulness. I have, therefore, the greatest pleasure in presenting to you Dr. HENRY SMITH PRITCHETT, President of the Massachusetts Institute of Technology. [Applause.]

IS THERE A PLACE FOR A PROFESSION IN COMMERCE?

HENRY SMITH PRITCHETT, Ph. D., LL. D.,
President Massachusetts Institute of Technology.

The opportunity to meet a body of men engaged in a great manufacturing industry such as occupies the members of the New England Cotton Manufacturers' Association is one which is most highly appreciated by the men who have to do with technical schools. Nowhere in the world is there a closer connection between industrial success and industrial education than in New England. Those who are studying educational progress desire, most of all, to come into contact with the men who are directly engaged in the world's work. I trust, on the other hand, that it may not be wholly without value to the man of practical affairs to listen to a word from the standpoint of him who has to do with education. If he can serve no other purpose he can at least occupy a half hour in calling attention to the fact that this Commonwealth, and New England in general, has been called upon, more than once, to face a readjustment of its industrial life. Time was when agriculture was our main support; later the fisheries contributed in large measure to the wealth of this region, and it does not seem unlikely that marine farming may again be a source of great profit to New England; later, for at least a considerable portion of New England, manufacturing has become the chief source of income, and we do well to remember that the present stage of manufacturing is not permanent, and that we are in the midst of an evolution in our manufactures. I purpose to try to point out, briefly, the

fact that in such an industrial readjustment technical education has played and will play an important role, and to suggest that in manufacture and in commerce and in administrative work in general the trained man will in the future have a constantly growing advantage over the untrained man.

From the statistics published about a year ago I find that the value of the export trade in cotton manufactured goods which pass over the boundaries of various nations amounts, approximately, to over five hundred millons of dollars. I was struck by the fact that of this total business only about twenty-three millions belong to the United States, notwithstanding that this is the country in which nearly nine-tenths of the raw material is grown. I was further struck by the fact that the little mountain republic of Switzerland, having no seaport and in which not a pound of cotton is raised, has an export business in cotton manufactured goods of nearly one and a half millions more than that of the United States. These facts are suggestive, to say the least.

I take it that it is your wish to extend your traffic and to increase the export to all parts of the world, in other words, to have a wider market and a larger production. The discussion of any means to accomplish this would involve us in the usual talk about the tariff, about labor, and about the many other factors which might enter into this result. This discussion I do not purpose to enter upon, but I wish to occupy the few minutes which I shall use to call your attention to another phase of the question, and to suggest that the changed conditions of modern life call for training which shall give men a knowledge of those conditions and the ability to cope with them, that the present period is one which calls for extraordinary ability in the organization and administration of vast business affairs, and that an education may be given which will fit men in better measure than they are now fitted to deal with such problems.

Modern industrial progress in America, whether it has to do with manufacture, export trade or the administration of large business enterprises, concerns itself with many factors; but apart from the questions of the individual skill of the engineer,

of the foreman and of the laborer there are three phases of the present period which seem to me specially significant, and which seem likely to be more influential in the future. One of these has to do with the physical conditions which obtain in manufacture and in commerce, one concerns the technical quality of the work done by the producer, and the third, while it has to do with both of these, yet reaches out so as to involve with them all social and political relations. The three factors to which I allude as distinctly characteristic of modern industrial life are, first, the ease of communication and of transportation, secondly, the influence of the trained engineer and the effect of his training upon the mechanic, and lastly, the tendency in all directions to concentration and organization.

It would scarcely be denied, I think, that the first of these factors is that which most distinguishes modern conditions of commerce from those of a hundred years ago. The effect of railways and steamships lines and cables in bringing the world together, the giving the man who sits in New York or London the power to know at one moment the commercial data of the whole world, to start a cargo from an Atlantic seaport and to know in advance the day upon which it may be delivered in Liverpool, has operated to bring about a condition of affairs in which the man of commerce of today may know or may command the information of the whole world hour by hour, and may act from that information with as great certainty as the local merchant could act a hundred years ago with regard to trade in his own town. Of all commercial facts which make the modern world a contrast to the world of even a century ago, nothing is more startling, nothing more far-reaching in its consequences, than this marvellous improvement in inter-communication. It makes possible enterprises conceived in the brain of one man and carried out simultaneously over the whole world; it makes possible on a world scale what was before only feasible on the scale of a county or a city; it makes America, Asia, Europe and Africa next door neighbors and within hailing distance, instead of being separated by weeks and months, and

this nearness makes possible those operations which in magnitude are so characteristic of our modern commercial life.

A second feature which seems to me also most important and most characteristic, at least of all American progress in commerce and manufacture, has to do with the quality and efficiency of the men who prepare manufactured articles for domestic use and for export; namely, the extraordinary efficiency which has resulted in the United States from the coöperation of the trained engineer with the trained mechanic. It is little more than a generation ago since men believed that an engineer could not be taught in the schools; an engineer, it was said, must learn his trade, it was then scarcely a profession, by the practice with other engineers. Bye and bye there came a belief that there was a groundwork which might be learned in a few years in a school, which would require years to learn by practice, and which in many cases never could be learned. The result of this training bore fruit in the rise of a generation of engineers. These men had a far higher type of training and had a far stronger equipment than the generation whom they succeeded. There was still room for the trained mechanic and the trained foreman, and the result of the whole process was to bring about a body of engineers at the top who in turn instruct the foreman and the mechanic below them in such a way, that, together, they form today the most effective industrial organization in the world. The training of the engineers who have graduated from the technical schools forms only a small part of the work which these schools have indirectly done. Each engineer who has charge of men has become himself an instructor of the mechanic and of the laborer below him; and it is this combination which has been the basis of our industrial efficiency. This union has in the past decade accomplished wonders, not only in its success in inventing means to accomplish ends, but also in the success with which it has met the economic problem of contending with cheaper but less skilled labor.

The third feature of modern industrial life to which I allude is the tendency to organization and concentration. This ten-

dency is evident in all directions, whether one considers the enterprises of capital or the brotherhoods of labor. Almost all social organizations show in these days a tendency to combine, unless it may be in the case of the churches; perhaps even with them it may be possible at a later date to conduct missionary work under ecclesiastical unions.

It is not my purpose to discuss the development of this tendency nor its ethical significance, if it has such. I merely refer to it as a fact, and as a distinctive characteristic of modern conditions, and as being, further, a tendency likely to persist in the future.

Let me, now that I have called attention thus briefly to the three facts which seem to me most significant in the conditions of modern industrial life, try to point out the manner in which these conditions concern the education of the man of commerce and the man of administrative work. It has been a noticeable feature of the progress of the last generation that those who produced from the raw material the manufactured product, the engineer and the superintendent, receive their training in the schools; whereas those who undertake to dispose of the manufactured product, who organize the enterprises of commerce, who direct industries, and who have to do with manufacturing and trade in their widest directions, of these men it is said, as it was said forty years ago of the engineer, that they must learn their business by experience; that they must get their training by touch with other men; that there is no groundwork of knowledge to which they may be pointed in the schools, and which would not only save time for them, but which would also develop for such places men of wider vision and stronger character, and of greater resources. I shall try and point out why in my judgment the conditions to which I have alluded make necessary such a training; to show, in other words, that under modern conditions the duties of the manufacturer, the man who directs export trade, and the man in railway administration are rapidly becoming those of a profession, and not those of a business.

The relation of the quickness of intercommunication to the duties required of the administrative man in commerce are evident at a glance. Before such means of communication were established these men either traded in local commodities which required only a knowledge of local conditions, or else loaded their ships with one class of commodities which were exchanged in a foreign port for another class. The process was rather one of trade than of commerce, and the complexity of modern conditions as compared with the old is enormous. The man who would deal intelligently in the commerce of today must know not only the conditions in his own country, but also the conditions in other parts of the world; or he must at least know how to go to work intelligently to find out those conditions. In other words, the man of commerce of today is concerned rather with world conditions than local conditions.

The significance of the second fact to which I have called your attention, that of the relation of the trained engineer to the mechanic and the laborer, is found in the fact that it enables higher paid labor and well paid skill to compete successfully with poorer paid and less skillful service.

Many instances of its success might be given, but a single one will suffice. On the great lakes a part of the problem of the cheap production of steel depended upon the cheap and prompt carrying of the ore; the application of American engineering ingenuity to this problem has produced such good results that a ton of ore can be carried one mile by the energy generated by one-third of an ounce of coal. In other words, a piece of coal no larger than the end of your little finger generates in its burning the power to transport one ton one mile. It became necessary to tranship this ore from ship to train at large cost if it were to compete successfully with cheapness of ore handled by cheaper labor. The same combination of engineer and mechanic reduced the cost of handling from sixty cents to four cents a ton. Nothing in the last quarter of a century of industrial competition has been more striking than the manner in which trained engineering skill, directing competent mechanics and laborers,

has, during the last fifteen years, and through a financial crisis, successfully met in competition cheaper and less skilled labor; nor can it be doubted that in the industrial progress of the future the same combination of theoretical training with practical skill is to form one of the chief factors of success.

The significance of the third fact to which I have alluded, namely, the tendency to concentration, is too constant a topic of discussion in the daily press to escape daily attention. It is the significant fact of the past decade in the evolution of our American industrial and mercantile life. It has given rise to much serious thinking and to much foolish talk. Leaving aside irrelevant considerations it may be stated that the tendency to concentration has doubtless come because such a movement has served a real end, and for this reason it is likely to remain a feature of industrial organization. It is not part of my purpose to discuss the future of this tendency in the social order. Combinations of capital of some sort are likely to continue so long as they are formed inside the law and so long as they serve real purposes; and the right of men to combine in such industrial enterprises to promote efficiency and to cheapen production seems to me clear. Most of the writing and still more of the talk in recent years of the moral obliquity of such efforts have been entirely apart from the real question. The difference between the man who manages a commercial enterprise on a small scale and the one who organizes a great industrial combination or trust is a difference of outlook, a difference of opportunity, a difference of ability; not a difference of morals. It seems to me, further, that the spectacle of a trust buying up factories wholesale, while not without food for thought, is not so terrifying as many would have us believe. I have been told that if we took into account the number of scrap-heaps which have been sold to the trusts under the name of factories, one now and then might squeeze out a tear of sympathy for the syndicates themselves.

In the same way the right of men to organize to protect labor and to secure for themselves rights and even privileges is equally

clear. It is practically certain, to my thinking, that both of these forms of combination have come to stay in a more or less modified form. They may be accepted, not only as a feature of our present industrial development, but as a probably still more important factor in the future; as such a factor it is my purpose to show that this fact concerns itself also with the quality of training which those engaged in the administration of industrial enterprises should have. It is not my purpose, as I have already said, to discuss the question of trusts or of labor combinations, and yet, in passing it is proper to say simply this: the formation of a trust, whether it is a concentration of capital for a great industrial enterprise, or whether it is to control men's labor, means the concentration of power in the hands of a few men. The difficulties which have beset both classes of combination and which have brought upon both merited criticism, is the fact that men have desired this power and have undertaken to wield it while refusing to assume the responsibility which such power must carry with it. There is no stronger passion in the human heart than the love of power, and no passion is more likely to lead to abuse. To place in the hands of any man or of any group of men irresponsible power is to put a blade without a handle into the hands of a swordsman; such a weapon wounds him who wields it no less than his antagonist. It may be assumed as certain that if such concentration of power is to be made, whether in the hands of one sort of men or another, society will demand, and this demand will be enforced, that such quasi-public assumption of power shall be held in due regard of the responsibilities which go with it.

One of the evidences of such appreciation of responsibility is the appointment of the best men to represent the forces which are combined in an association or in a trust, whether these be men or dollars. The lack of such recognition of responsibility is not confined to any one set of men, or to any single organization. Selfishness and avarice are no more the property of one class of men than are truth and honesty. We smile at the lack of judgment which puts forward the walking delegate as the representa-

tive of honest workmen, and yet it is well matched by the simplicity which assumes that the monthly visits to the factory by a New York stockholder will take the place of intelligent local supervision. The representatives of more than one syndicate have been able to point out most intelligently the short-sightedness which arrays labor against capital, and yet these same men have replaced skilled engineers with the sons of directors, and then have mildly wondered why the reputation of their product fell away, why their employees were discontented, and why dividends were no longer possible. My impression is that the trusts cannot be wholly bad because they give so many evidences of the possession of one of the sweetest of human virtues, that of simple, childlike faith.

To come back, however, to the real matter in hand, I wish to call your attention to the fact that those who are called upon to administer under the conditions of modern industrial life must be in a position to understand and to deal with this question from both sides, and that this ability requires not only breadth of vision, openness of outlook and fairness of mind, but that still rarer quality, the ability to understand the other man's point of view; and it is evident, to my thinking, that there is needed, in ever increasing degree, in the administrative relations of commercial life, a class of men who can deal with the problem of the relation and the rights of men in an intelligent, sensible and sympathetic way. The reason for this great need is strengthened by the changed conditions of our social life in New England, as compared with those of a generation ago. At that time there was no such width between the different social orders as at present. The laboring man stood in a far closer relation to the man of business; each understood the other better, and the gradation of social orders was far more gradual. Many influences other than those of business operated more powerfully at that period to bring about a common understanding between all orders of society than at present. The influence of the church in this direction was unquestionably greater then than now; it brought together in a common place of meeting rich

and poor alike, as it does now to a less degree at least in Protestant churches.

What I am coming to, therefore, is the thought that, in the changed conditions of today, a man ought to be educated in some broad view of the relation of men to each other, if he is to assume administrative duties in commercial affairs of large magnitude. Such men will be necessary more than ever, in order to bind together men of different classes, and in order to interpret one class to another. If certain ties which have heretofore held class and class together are lacking, then education must take the place of such ties; and not the least part of that education will be that which teaches men who are in control of affairs some wider view of the rights of all classes. This ability to deal with different orders of men, to understand their point of view, to interpret to each of two sides the motives of the other, is to be one of the most valuable qualities which the administrative man can acquire, whether he serves a corporation or an association of men; for it is still true, in the sense in which BACON wrote it, and yet more true in a very different sense, that "the greatest trust between man and man is the trust of giving counsel."

To bring together, therefore, the conclusion of my whole argument, the conditions of modern life are such, the facilities of communication are so great and play such a part in success, the relations of men are so complex and upon so large a scale, that the time is near when those who are to direct great organizations, who are to control and develop manufactures, who are to trade between nations — in a word, the Captains of Commerce — must look upon their calling as a profession, not as a business; and for this profession there is a training to be had in the schools which will not only save time for the individual, but which will develop a broader, a more efficient and a higher type of man; a training which shall bring not only a keener vision but a wider outlook and a better perspective.

I have already alluded to the significant fact that the man who prepares the raw material into the manufactured product is now

almost always of college training; but forty years ago it was considered just as impossible to train an engineer in the schools as today it is thought impossible to train the man who directs railroads or banks or export trade or manufacture. Doubtless such courses of study as might be inaugurated at this time would be in large measure tentative, as they were in the case of the engineer. That efforts already made in starting schools of economics do not meet the case is evident from the fact that the few who attend these schools afterwards go into this vocation and not into commerce. The same was true of the courses of study first offered to the engineer. The studies prescribed forty years ago show a great contrast to those of today. And in this gradual adaptation of a training to the needs of certain professions there has resulted not only the evolution of a course of study, but also the uplifting of a whole circle of professions. I can but believe that similar facilities offered to students of commerce and of commercial relations would result, likewise, not only in finding a training fitted to their need, but also that it would result in bringing in a higher ideal of the work and of the responsibility of the man of affairs.

I feel that the case may be put even more strongly, and that one may safely say that intelligent training is itself a source of power and a factor in the relative growth of nations as well as of individuals. That, further, if commercial supremacy is to be won for America, it must be won only by means of the best equipment, of the most efficient means, of the highest training; and that such supremacy, if it comes at all, will rest ultimately with those who are wise enough to understand the significance of modern conditions, who have sufficient outlook to appreciate the motives of other men and of other nations, and who recognize fairly and with full knowledge that the acquiring of power involves the assumption of responsibility. If these enter as factors in the success of the man of commerce, then a foundation for them may be laid in the schools.

The Secretary read the following letter:

AMERICAN ASIATIC ASSOCIATION,
BOX 1500, NEW YORK, N. Y.,
April 22, 1901.

C. J. H. WOODBURY, Esq.,
Secretary, New England Cotton Manufacturers' Association, Boston, Mass.

Dear Sir—

This Association proposes to issue a call for a convention to be held at Buffalo on June 7, to discuss the general question of American Interests in the Far East, and it is our desire to secure as full a representation as possible from other organizations whose members are more or less interested in the promotion of trade with China, Japan and Oceanica. As not a few of your members are participants in this trade, may I ask you to submit to your Executive Committee or to the general body of your members at the approaching annual meeting the desirability of appointing a number of delegates to attend the Buffalo Convention? Should this suggestion meet with the approval of your Association, further conference can be had in regard to the subjects to be discussed and other details which may be subject to prearrangement.

Yours respectfully,

JOHN FOORD, *Secretary.*

The PRESIDENT. Shall there be any action upon this communication?

Mr. WALTER E. PARKER. I move it be laid on the table for the present.

The motion was seconded, and being put to vote, was declared carried.

PRESIDENT'S ADDRESS.

D. M. THOMPSON, Providence, R. I.

Gentlemen —

In the performance of my duty I find much pleasure in bidding you all a most cheerful welcome to the seventieth convention of the Association.

Since our last meeting we have passed from the nineteenth into the twentieth century. It is a memorable event and suggests a careful consideration of the past as a guide for the future. Your Association was founded 35 years ago. While a comparatively brief period, it represents 70 per cent. of the 50 years since 1851, during which time the larger part of the world's marvellous achievements have been wrought. As we review the events and note step by step the inventions and contributions of genius in their practical application to the industrial arts, and further observe the progressive movement in systems and business methods, we are well nigh appalled at the wonderful exhibit. There is sufficient to compel the most serious thought and the desire to know what the future portends. We are well aware that the operations of these marvellous forces have produced our modern civilization and have advanced all of our people into higher planes and more comfortable living. The movement is destined to go steadily onward along the lines of a progressive development which reaches beyond our vision.

Our experience in the past contributes the means of protection in the present and the only guide in preparations for the future. The marvellous achievements of the past inspire an ambition

which is boundless in its aspirations. In the operations of business, conditions are continually changing; they involve questions which compel grave solicitude and justify the most careful conservatism and, again, the opposite, in prompt, bold and aggressive action. The lines drawn in the competitions of trade are sharp and incisive. "It is a survival of the fittest". We can appreciate the solicitude and the anxieties of those charged with the burdens of great responsibilities in banking, commerce, trade and manufacturing. The watchword is "eternal vigilance", the only safeguard and assurance of success.

RESPONSIBILITIES OF THIS ASSOCIATION.

This very brief reference suggests a sphere within which there is illimitable material worthy of careful consideration. There are questions likely to arise in connection with your interest such as you have not undertaken in the past. I have no question that after due reflection your action in the matter will be wise. The objective purpose of the New England Cotton Manufacturers' Association is declared to be the "encouragement of scientific investigation and experiment as to the methods of manufacturing cotton; collecting and imparting information relating to this industry and promoting social intercourse among its members, and to establish and maintain a library of works on textiles in the city of Boston". It is along these lines that the past work of the Association has been done. The results are duly recorded, and constitute enduring testimonials to the wisdom of the founders. The Association has received wide recognition and has become a power of commanding influence. Its achievements have become such as to justify your pride and reflect honor upon all who have in the past contributed their efforts in its service. In the natural order we may expect this work to go forward steadily improving.

In this connection, I wish to suggest the importance of securing a more extended and general participation of members in the work of the Association. It is desirable that more papers shall be presented which treat directly of questions concerning

the material, machinery, and process of manufacture. This brings into the foreground the active members and managers of the mills. It is a matter of very great interest that members shall more freely engage in the discussion of the papers presented and also the topical questions. In the accomplishment of this object there is nothing of more value than the "promotion of social relations", becoming better acquainted and securing each other's confidence. Apart from the pleasure to be derived, reciprocal interests will develop of substantial value.

I suggest for your consideration the proposition that the time has arrived and the business conditions are such as to justify a broadening of your Association work. Hold fast to that which you have, but extend your operations into wider spheres of action. You are familiar with the steady but remarkable progress of the past. It has touched every department of trade and industrial occupation. Methods and systems have changed. You are entering into a new epoch. You are to meet conditions such as have not heretofore been presented. Your experience and observations have been sufficient to impress upon your minds the necessity of preparation to meet the exigencies of the future.

You are conversant with and appreciate the value of organization. Its functions are of incomparable worth in the attainment of objects of vital interest. Evidence of this abounds in the innumerable associations which have been organized during the past ten years for the purpose of promoting interests not otherwise possible. Your Association is among the oldest. The interest in cotton textiles, which it represents, is one of the most important in the industrial arena of the country. These interests have been developed through conservative management and a steady growth. The business has been restricted to a domestic trade; the consumers have been our own people. These conditions are changing and we are now in need of an outlet for our surplus products. In this connection we are reminded that "there is a destiny which shapes our ends", and

human forces are the instruments which are employed in its achievement. There are questions which confront the financial management of the cotton industry of the United States such as have not heretofore been considered; some of them are of vital import and demand early and serious attention.

I believe this Association can be employed in such manner as to render incalculable service. It can accomplish exceedingly valuable work in the matter of information and kindred material relative to foreign markets for an export trade. Very much of this is being done through United States consuls, and notably by the Philadelphia Commercial Museum, as also by the National Association of Manufacturers and others, all of which has been inaugurated during the past six years.

Your Association should be prepared to deal with questions that concern the general interest, but which require the exercise of certain influence which shall reach all parties and in a manner to insure confidence. It is well for you to consider that these methods are now being inaugurated, and applications have been made with substantial results. Nearly all interests are coming to recognize, as never before, the value of coöperative work. In other words, there is much more than formerly a disposition to promote matters of mutual interest. It is a principle worthy of commendation.

I trust you may take favorable action in the matter of this extended service. The course will, of necessity, involve an appropriation to meet the increased expense. This could be accomplished for the present by a moderate addition to the present dues. I feel assured the results will more than justify the outlay, which I trust all members will approve.

FOREIGN MARKETS AN IMPERATIVE NECESSITY.

There are few who will question the presence of a Divine influence in human affairs. The policies and forces of nations are operating factors in the accomplishment of a predestined purpose. The marvellous achievements which have produced our modern civilization are the result of forces which are destined

to be continued in operation until they embrace all humanity. The methods employed in the attainment of these results are means of communication, acquaintance, the establishment of confidence and the consequent relations which follow and insure trade and commerce. It is not a charity in the sense of contribution, but a practical mission operation which disburses a full measure of business profit to all engaged in its service. Can we for a moment believe that the United States of America, having attained its present position of vast power and wealth, will longer be permitted to withhold its forces and influence in the advancement of civilization? Our pathway of duty is clear and unmistakable. Americans are now preparing to take their just share and part. In the progress of events there will always appear what may be termed the natural way. It oft appears in the light of subsequent development as a predestined condition. It is a line along which people who are involved in the operations must move.

The opportunity came to us through the Hispano-American war. It was not of our seeking. Every means consistent with national honor was employed to avert it. The world is familiar with its history. The United States have accepted its results and responsibilites. In the line of our future growth and development, our Philippine possessions, apart from their own worth, will prove of inestimable value as a means of access to the trade of the East—an influence not otherwise possible.

The present troubles in China are greatly to be regretted because of the loss of life, the waste and destruction of property; yet it is but a natural result of the forces in operation, and probably necessary to the initial entry upon the work of modern civilization. The interests of the United States are of vital importance and justify the most earnest solicitude and active influence of the Federal government, to the end that an open door shall be established.

The development of American industrial interest has moved with rapid strides. The achievement in all lines of useful work has been marvellous. The inventions in machinery and labor-

saving devices, united with the improvement in systems and methods, have, in nearly all occupations, resulted in over-production. More goods are now made than can be taken in our home markets.

Under this condition, it is impossible to steadily employ American labor. The inevitable result is disturbance of trade; it is a condition likely to occur often, the cycles of activity being of brief duration. It is therefore an evident necessity that we shall procure an outlet for our surplus products. Within the past few years very much valuable work has been done in this direction through trade organizations, and more recently important service has been rendered through the government consular service. It is a work of vital importance to the cotton manufacturing interests of the United States and demands the serious attention of this Association.

DEPRESSION IN THE COTTON INDUSTRY.

The environments of the cotton industry from a commercial point of view are very unsatisfactory. The conditions are such as to cause grave anxiety for the immediate future. The prosperity of 1899–1900 was of comparatively brief duration. We may be reasonably confident as to the causes which have produced this result, but what is the remedy?

It is possible there may be disturbances which are not yet appreciated. In its results it is an absolute and effective depression which embraces all cotton textile interests. We had acquired a foreign market for about $23,000,000 of our products. The disturbances in China, other troubles in the East and the war in South Africa, have very seriously interrupted this trade. To the extent that this applies we must abide the termination of the troubles, but the effort for other markets should be pushed with redoubled zeal.

There are other causes which have doubtless contributed to the present condition. We have but recently passed through a national election which is generally a serious factor of disturbance. Recovery from its effects is not usual until the opening

of spring trade. The general conditions of trade throughout the country at present indicate substantial conditions of prosperity. The labor is being employed at good wages, and its purchasing power is unimpaired. The conditions of the cotton manufacture is in a measure complex. To a limited extent there is over-production. There is a comparatively moderate amount of goods in store. The high price of cotton occurring coincident with the abnormal depression referred to has produced a serious disturbance and the manufacturer has been unable to secure relief in the market. Reduction of wages has been talked of by some, but nearly all have agreed that such action would be ineffective. If 20 per cent. were removed from labor it would not suffice, and whatever the reduction under existing conditions a corresponding reduction of the goods would be determined in the markets. It is a serious condition and its duration under present circumstances may continue indefinitely. There is, however, means of sure relief if they could be effectively applied.

The manifest remedy is curtailment of production. If this could have been arranged to begin February 1st, and suspend operations for six weeks during the period to June 1st, the troubles would have ere this disappeared, 400,000 bales of cotton would have been eliminated, and the market price of production would now in all probability be satisfactory. I am well aware of the difficulties in effecting such arrangements. They would generally be regarded as impractical, nay, impossible. To this view, however, I should take some exceptions, for I believe that means can be devised to meet the most difficult proposition. In other words, questions are being successfully dealt with today that would have been regarded as impossible in former times. It must be borne in mind that these troubles under existing conditions are likely to occur at more frequent intervals than we have known in the past and we should be prepared to meet them.

This is manifestly a work which justifies the serious consideration of this Association. You have the material or it is avail-

able that will enable you to render just such service as this in an effective and successful manner. It will require much effort and great skill, but the object is worth it, the end will justify the means. Individual effort, however able, would be absolutely inadequate. Important operations, such as here suggested and many other lines of useful work, are possible of achievement only through a strong association of well organized membership.

In this connection I suggest that every proper means shall be employed to increase your list of active members and especially among mill treasurers, many of whom are with you, but all should have membership in this Association. There is sure to be important work in the future that will command their attention and justify their service.

THE COTTON INDUSTRY IN THE SOUTH.

I desire to congratulate the members and all of the people who have interests in the cotton industry of the South. I have the pleasure of a large personal acquaintance among them which began 25 years ago. How great the change since 1876. From impoverishment they have risen into a commanding position of prominence and in 1901 have realized their aspirations in the accumulation of wealth and the means for the employment of their people.

The possession of nearly 5,000,000 of spindles and the consumption of 1,600,000 bales of cotton in their manufactures, is a condition of more than local, it is of national interest. The prosperity of 20,000,000 of people in the South is of interest to all sections of the country. It is a condition even now at hand, but destined to be greatly extended with the development of the vast resources which surround them. The cotton manufacturing industry, while important, constitutes but a fractional part of the demands which are yet to be made for their labor. The South has reason to be justly proud of her achievements and grateful for the opportunities which lie before her in the future.

RELATIONS TO KINDRED INTERESTS.

In the review of this question, which is of vital interest to the North, and far more to the South than may at first appear, there are many phases of it which deserve consideration. I do not propose to enter at length upon the discussion of the subject, but simply present the general proposition, with brief suggestions. I do this from a sense of duty, but actuated by the kindliest feelings. In this connection I may be pardoned the statement. It is generally well known that for the past twenty-five years I have not only been friendly but have taken a deep interest in Southern affairs. Predictions relative to the cotton manufacturers of the South made twenty-three years since have been fulfilled. The conclusion was reached after careful study of physical and other conditions then existing. I was conscious that the operations would involve much inconvenience to Northern interests and a loss to those who failed to avail themselves of a transfer of their coarse goods productions into the South. Other than this, upon general principles, the changes would likely be of such interest to all sections that the compensations would prove adequate.

I believed then and yet hold that view, that the South should confine its operations to the coarse goods with possible medium counts of yarn and low grade fabrics. This line would embrace to a larger extent their natural advantages. Later developments exhibit a very considerable diversification, indicating a confidence in the higher grades of fine yarns and fabrics. This action would be justified if the present conditions in respect to hours of labor and the existing prices therefor were normal and could permanently endure. It is not reasonable to suppose such a condition as possible. In the natural order the time will surely arrive when Northern and Southern interests will reach a plane of substantially uniform conditions. How long a period this may involve and the extent of loss and injury which will attend the operations are questions yet to be solved.

In the South there are two states which limit the running time of mills to 66 hours per week; in others there are no re-

strictions. The cost of labor to the Southern mill does not exceed 60 per cent. of the cost of similar labor in the North. The running time of Northern mills is 60 hours per week, except in Massachusetts, 58 hours. Hence the difference in the cost of production upon the basis of parallel conditions is 20 per cent. in favor of the South. If the abnormal conditions, such as running time and wages, were adjusted it would remove 83 per cent. of the present inequalities and leave about 3½ per cent., net, as representing natural advantage; against this there could be no complaint.

In the natural order of development there can be no question the South will advance into a plane of equality comparable with other sections. Its labor is deserving of as much consideration as the labor of any other locality. There can be no question that the compensations would prove an adequate recompense for any immediate sacrifice. It is an important problem, one which the South must settle for themselves, ever bearing in mind the grave issues at stake. The industrial fabric within the United States is a homogeneous structure; its component parts are interwoven in such manner as to compel a consistency of all its constituents. It is manifestly of deep interest to the South as well as to the North that proper and equable relations should exist. It is equally manifest that serious injury to Northern interest will react upon the South; it will be inevitable. There is a community of interest in all our domestic affairs which may for a time escape notice, but which will finally compel recognition.

Natural laws may for a brief period be ignored, but they are sure to reassert their power and become operative. The 16,000,000 of spindles in the North, together with the vast number of people employed and the capital at stake, constitute forces which must be considered in the settlement of these questions. I believe it is possible to find a solution which will do injury to none but will conserve the interests of all. It is only necessary to establish the community of interest principal and secure the acknowledgment and recognition of real and genuine physical conditions when agreements would readily follow.

There is no just ground or cause for contention except for the conditions cited. The development of American industrial interests are now moving upon lines which give promise of a rapid growth in the future. In the distribution of these there will be sufficient to satisfy the reasonable ambition of both North and South. The demand for the products of Western Europe and America are destined to equal the possible supply. It is only necessary that Americans shall perform their just share. In the securing of this trade it is important that the cotton textile interests of the United States shall be united. Such conservation of forces would be of incalculable value. It would insure the largest possible measure of profit to the business, and to a large extent protect the industry from depressions such as exist at the present time.

I submit the several matters for your consideration, believing there are questions of grave interest at issue and such as may justify your serious attention. It is a work which must be done — if at all — through a representative body such as this Association. I am well aware that it is a difficult proposition, but trust that you will be able to devise measures to meet it. However diverse the views may be upon the first thought, a careful consideration of the subject will reveal elements in the problem of deepest interest.

THE SECRETARY'S REPORT.

The gavel used at this meeting of the Association is of especial interest, being made of one of the oak timbers from No. 1 mill of the Boston Manufacturing Co. at Waltham, Mass. This mill was built in 1813 by FRANCIS C. LOWELL and his associates and was the first establishment to convert cotton into finished goods by machinery operated by power, and as such, it is the pioneer cotton mill in the United States and probably in the world and in this respect the precursor of this one of the world's great industries.

The details of the student's medal which was reported upon and approved at the Washington meeting, have been arranged by the Board of Government. MOSES PIERCE, of Norwich, Conn., an honorary member, gave to the Association on his ninety-second birthday, July 3, 1900, a sum of money which the Board of Government, with the approval of Mr. PIERCE, recommended should be set aside as a fund whose income should be applied to bronze medals struck from the dies of the Cotton Manufacturers' medal and entitled the Student's Medal, one of which should be awarded for some grade of excellence to a member of the graduating class each year in such textile schools as may be selected by the Board of Government under such conditions as may be mutually determined by them and the several institutions of learning. The Board of Government reported these recommendations to the Association at its sixty-ninth meeting held at Washington, D. C., October 18, 1900, and the Association unanimously voted its approval of the plan. A special committee investigated all of the institutions in the

United States known to give textile instruction, and in conformity with its recommendations, the Board of Government voted that the medals should be awarded on the basis of general excellence to one member of each graduating class as might be selected by committees of three members of the Association appointed by the President for each of the following institutions:

Lowell School of Design, Boston, Mass.
Philadelphia Textile School, Philadelphia, Pa.
Lowell Textile School, Lowell, Mass.
Georgia School of Technology, Atlanta, Ga.
New Bedford Textile School, New Bedford, Mass.

This offer has been accepted by each of these institutions of learning, and it is hoped that this Association in its purpose to develop and improve everything pertaining to the manufacture of cotton will prove to be both an incentive and a just reward to some of the future captains of the industry who are now students in the textile schools.

One element of the importance of the Transactions of this Association is the frequency with which citations are desired from these volumes by members and visitors and also in the routine work of the office. While the later volumes are provided with indices, yet there is need of a full index of the whole set, and the Board of Government has authorized the preparation of a card index which the experience of the past few years indicates will serve a highly useful purpose. The preparation of this card index will require a long time as an examination of the Transactions to date estimates that it will require 9,000 cards for this purpose.

Although the members of the Association are men of action rather than words, yet it is felt that it is due to those who prepare papers for the meetings that the members should offer the results of their observation and experience in the discussion of these papers, and it is no disparagement to the merits of any formal paper to quote the oft repeated statement that a discussion is frequently of greater interest than the paper, because in

the interchange of opinions, on the floor, the authors frequently present the live issues of the subject more incisively than in the formal paper. As a result of the consideration of the subject by the Board of Government, the following tabulation of the amount of discussion at the preceding meetings is submitted as being of interest to the members as well as to the officers. This tabulation shows that conditions leading to a discussion are based on uncertainties of the occasion which develop a verbal consideration of the subject.

TRANSACTIONS.

Volume.	Pages.	Discussion.	Volume.	Pages.	Discussion.	Volume.	Pages.	Discussion.
1	23	0	24	70	13	47	120	14
2	15	0	25	79	45	48	43	12
3	21	0	26	78	60	49	52	14
4	36	3	27	122	49	50	129	11
5	29	21	28	99	55	51	60	18
6	47	11	29	80	42	52	63	37
7	24	13	30	66	45	53	94	33
8	30	7	31	61	46	54	84	23
9	24	5	32	51	21	55	86	16
10	52	3	33	58	23	56	73	54
11	48	19	34	66	45	57	230	81
12	38	10	35	97	50	58	310	27
13	16	8	36	43	20	59	327	69
14	29	13	37	85	33	60	269	40
15	37	31	38	114	28	61	359	86
16	47	18	39	55	19	62	353	64
17	24	19	40	61	24	63	453	85
18	55	33	41	130	33	64	321	72
19	31	17	42	92	9	65	380	93
20	63	12	43	80	41	66	464	125
21	47	15	44	129	21	67	296	52
22	51	32	45	236	13	68	382	20
23	70	34	46	96	9	69	476	6

The mortality of the members of the Association has been unusually large during the past year, as is shown by the death of the following 15 members: JONES S. DAVIS, B. A. ALEXANDER, CHARLES L. BAILEY, JOHN W. DICKINSON, JOHN WATERMAN, MOSES PIERCE, STEPHEN L. ADAMS, JOHN HOLLAND, JAMES RENFREW, ARBA C. SLATER, ROBERT R.

SMITH, W. L. HUTCHINS, WINTHROP THAYER, JAMES G. HILL and GEORGE F. TRYON, biographical sketches of whom appear in the Transactions. At the beginning of the year the membership of the Association was 563, which has been increased by the election of 78 at the spring and fall meetings. This number has been diminished by the death of the 15 referred to, by the resignation of 7, dropping on account of lapsed dues of 3 and non-confirmation of election by 1, leaving in advance of this meeting a net membership of 615, to which should be added the number of 32 on the ballot list approved by the Board of Government, bringing the total number to 647 at the close of this meeting.

The Board of Government has held ten meetings during the year, in addition to which there have been meetings of subcommittees.

The following table shows the membership of the Association at various meetings since its foundation in April, 1865, the number elected and the number of present members:

MEMBERSHIP OF THE ASSOCIATION.

Number of Meeting.	DATE OF MEETING.	Membership.	Number of Present Members	Number Elected to Membership.
1	Apr. 20, 1865,	44	6	—
	July 19, 1865, Adj. Meeting,	—	1	—
2	July 18, 1866,	72	2	—
3	July 17, 1867,	—	1	10
4	Jan. 16, 1868,	108	1	14
5	July 15, 1868,	—	0	11
	Oct. 21, 1868, Adj. Meeting,	—	1	6
6	Apr. 21, 1869,	—	3	20
7	Oct. 20, 1869,	—	1	8
8	Apr. 20, 1870,	144	0	9
9	Oct. 19, 1870,	—	0	5
10	Apr. 19, 1871,	—	2	9
11	Oct. 18, 1871,	—	1	16
12	Apr. 17, 1872,	166	4	27
13	Oct. 16, 1872,	—	3	12
14	Apr. 16, 1873,	175	1	13
15	Oct. 15, 1873,	—	3	19
16	Apr. 15, 1874,	189	1	12
17	Oct. 21, 1874,	—	0	7
18	Apr. 21, 1875,	199	4	13
19	Oct. 27, 1875,	—	2	18
20	Apr. 26, 1876,	200	1	13
21	Oct. 25, 1876,	—	2	14
22	Apr. 25, 1877,	213	4	20
23	Oct. 31, 1877,	—	2	12
24	Apr. 24, 1878,	210	6	6
25	Oct. 30, 1878,	—	3	12
26	Apr. 30, 1879,	205	4	10
27	Oct. 29, 1879,	—	6	17
28	Apr. 28, 1880,	219	2	16
29	Oct. 27, 1880,	—	3	13
30	Apr. 27, 1881,	231	3	12
31	Nov. 30, 1881,	—	2	5
32	Apr. 26, 1882,	231	2	9
33	Oct. 25, 1882,	—	3	7
34	Apr. 25, 1883,	240	4	15
35	Oct. 31, 1883,	—	4	10
36	Apr. 30, 1884,	247	3	9
37	Oct. 29, 1884,	—	2	3
38	Apr. 29, 1885,	225	3	3
39	Oct. 28, 1885,	—	6	8
40	Apr. 28, 1886,	225	4	7
41	Oct. 27, 1886,	—	7	8

Number of Meeting.	DATE OF MEETING.	Membership.	Number of Present Members	Number Elected to Membership.
42	Apr. 27, 1887,	234	5	13
43	Oct. 27, 1887,	——	2	3
44	Apr. 25, 1888,	241	10	15
45	Oct. 31, 1888,	——	6	13
46	Apr. 24, 1889,	242	4	6
47	Oct. 30, 1889,	——	4	9
48	Apr. 30, 1890,	246	5	7
49	Oct. 29, 1890,	——	9	11
50	Apr. 29, 1891,	254	3	4
51	Oct. 28, 1891,	——	5	8
52	Apr. 27, 1892,	244	11	12
53	Oct. 26, 1892,	——	15	19
54	Apr. 26, 1893,	259	5	10
55	Oct. 25, 1893,	——	8	9
56	Apr. 25, 1894,	270	12	14
57	Sept. 27, 1894,	292	14	21
58	Apr. 24, 1895,	383	72	94
59	Oct. 24, 1895,	422	37	48
60	Apr. 29, 1896,	450	22	30
61	Sept. 22, 1896,	459	18	19
62	Apr. 28, 1897,	495	39	44
63	Oct. 27, 1897,	523	34	39
64	Apr. 27, 1898,	535	19	24
65	Sept. 29, 1898,	554	15	18
66	Apr. 26, 1899,	564	30	34
67	Oct. 5, 1899,	580	20	22
68	Apr. 25, 1900,	603	39	40
69	Oct. 18, 1900,	628	38	38
70	Apr. 25, 1901,	646	32	32

The headquarters of the Association have been well patronized by members during the year and the bound volumes of the Transactions and also the books of reference and technical papers have been frequently consulted by those without the Association as well as by its members. The rooms have been called into frequent use by members for various business conferences during the year.

The following diagram represents in graphical form the membership of the Association from its establishment.

The Transactions of the following societies and periodicals are sent to the Association and kept on file.

TRANSACTIONS OF TECHNICAL SOCIETIES.

American Society of Civil Engineers,	New York.
American Society of Mech. Engineers,	New York.
American Institution of Elect. Engineers,	New York.
Boston Chamber of Commerce,	Boston.
Bureau of the American Republic,	Washington.
Consular Reports, Bureau of Statistics,	Washington.
National Association of Wool M'f'rs.,	Boston.
National Electric Light Ass'n.,	New York.
Western Society of Civil Engineers,	Chicago.

List of Periodicals Kept on File.

American Wool and Cotton Reporter,	Boston.
Boston Journal of Commerce,	Boston.
Cassier's Magazine,	New York.
Cotton,	Atlanta.
Dry Goods Economist,	New York.
Electrical Review,	New York.
Engineering Record,	New York.
Fibre and Fabric,	Boston.
Iron Age,	New York.
Manufacturers' Record,	Baltimore.
Mill and Shop,	Boston.
New England Shoe and Leather Association Monthly Gazette,	Boston.
Power,	New York.
Power and Transmission,	Mishawaka, Ind.
Protectionist,	Boston.
Steam Engineering,	New York.
Textile Manufacturers' Journal,	New York.
Textile Recorder,	Manchester, Eng.
Textile Record of America,	Philadelphia.
Textile World,	Boston.

TREASURER'S REPORT.

C. J. H. WOODBURY, TREASURER, IN ACCOUNT WITH THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

April 1, 1900 to April 1, 1901.

DEBTORS.

Cash,	$616 58	
Active membership dues,	2,425 00	
Associate membership dues,	1,250 00	
Active admission fees,	500 00	
Associate admission fees,	575 00	
Interest,	67 92	
Sale of Transactions,	68 37	
Advertising,	1,200 00	
Medal and certificate fund,	1,000 00	
Engraving,	43 89	
Miscellaneous,	1 75	
Students' Medal Fund,	200 00	
Total,		$7,948 51

CREDITORS.

Board of Government,	$180 08	
Office rent,	399 96	
Secretary and Treasurer,	1,162 50	
Reports of meetings,	73 00	
Notices and stationery,	156 49	
Meeting expenses,	206 64	
Printing and distributing Transactions,	1,612 90	
Badges,	252 51	
Amount forward,		$4,044 08

Amount forward,	$4,044 08	
Stenographer and proof,	540 63	
Postoffice box,	10 00	
Advance copies of papers,	282 25	
Engraving,	1,022 38	
Miscellaneous,	42 15	
Postage, telegrams and express,	237 03	
Office supplies and furniture,	45 52	
Medal and certificate fund,	71 51	
Securities and cash,	1,652 96	
Total,		$7,948 51

AUDITOR'S REPORT.

I hereby certify that the amounts from April 1, 1900, to April 1, 1901, are correctly cast, that all payments are properly vouched for by bills approved by the Auditing Committee of the Board of Government, that the funds are kept on deposit in the name of the New England Cotton Manufacturers' Association, and that the amount of the deposit April 1, 1901, agrees with the balance in the books, viz., $452.96.

The securities in which the Association funds have been invested have been examined.

C. E. ROBERTS,
Auditor.

BOSTON, MASS., April 5, 1901.

The earnings of the Association for the year may be placed as:

491 active members at $5.00,	$2,455 00	
133 associate members at $10.00,	1,330 00	
49 active admissions at $10.00,	490 00	
29 associate admissions at $25.00,	725 00	
Advertising,	1,245 00	
Miscellaneous,	381 93	
Total,		$6,626 93

The expenses of the Association were $6,295.55, not including losses from lapsed dues.

The bills receivable are:

Active dues,	$270 00	
Associate dues,	200 00	
Active admission,	10 00	
Associate admission,	125 00	
Transactions,	15 00	
Advertisements,	170 00	
Total,		$790 00

The income derived from advertisements has enabled the Association to be conducted on the same basis as other technical organizations which are supported by higher assessments as well as by advertisements in their transactions. The amounts from this source have amounted in the several volumes of the Transactions to:

63	Philadelphia, September, 1897,	$385 00
64	Boston, April, 1898,	420 00
65	Crawford House, September, 1898,	450 00
66	Boston, April, 1899,	550 00
67	Montreal, October, 1899,	445 00
68	Boston, April, 1900,	580 00
69	Washington, October, 1900,	665 00
70	Boston, April, 1901, (already under contract,)	420 00

The following table presents the finances of the Association for the past eleven years.

MEMBERSHIP.			TRANSACTIONS.			FINANCES.				
Fiscal Year Ending April 1.	Enrollment.	Members Elected.	Volume Number.	Pages in Volume.	Pages for Year.	Cash Receipts.	Expenses.	Cost per Page of Transactions.	Cost per Member.	Cost per Page of Transactions for each member Cents.
1891	246	18	48 49	43 62	105	$1,142 00	$ 926 08	$8 82	$3 76	3.59
1892	254	12	50 51	129 60	189	1,260 68	1,374 46	7 27	5 41	2.86
1893	244	31	52 53	63 94	157	1,678 33	1,603 25	12 22	6 57	6.33
1894	259	19	54 55	84 86	170	1,414 58	1,807 60	10 63	7 03	4.14
1895	270 292	35	56 57	73 230	303	1,947 07	1,957 64	6 46	6 71	2.21
1896	383 422	142	58 59	310 327	637	4,579 19	3,636 31	5 71	8 59	1.34
1897	450 459	49	60 61	269 359	628	3,710 02	3,980 34	6 33	8 67	1.43
1898	495 523	83	62 63	353 453	806	4,717 08	4,333 85	5 38	8 28	1.18
1899	535 554	42	64 65	321 380	701	4,713 56	4,775 97	6 81	8 62	1.23
1900	564 580	56	66 67	464 296	760	5,237 53	5,007 23	6 57	8 63	1.14
1901	603 628	78	68 69	382 476	858	6,331 93	6,295 55	7 34	10 02	1.16

April 5, 1901.

Respectfully submitted,

C. J. H. WOODBURY,

Secretary and Treasurer.

SECOND SESSION.

WEDNESDAY AFTERNOON, APRIL 24, 1901.

Meeting called to order at 2 P. M., President THOMPSON in the chair.

The following papers were read:

A Modern Textile Machine Building Plant.
(Illustrated by the stereopticon.)

H. G. McKERROW, Boston, Mass.

Discussed by Messrs. C. J. H. WOODBURY, THOMAS HENRY SMITH and WILLIAM F. SHERMAN.

Accounting for Cotton Mills.

A. O. KITTREDGE, New York, N. Y.

Discussed by Mr. ARTHUR H. LOWE.

The PRESIDENT. Before proceeding to the next subject, I will appoint a committee on resolutions, composed of Messrs. FREDERICK A. FLATHER, ARTHUR H. GULLIVER, OSCAR B. TRUESDELL, THOMAS G. COX and CHARLES D. ROBINSON, who will prepare resolutions of thanks to the speakers, to those authors of papers who are not members, to the telephone companies, and to others to whom we may be indebted for courtesies.

The SECRETARY. Mr. President, perhaps it would be a convenience if the gentlemen of the committee whose names were read should meet after this session with Mr. FLATHER, the chairman of the committee.

Humidifiers in Cotton Mills.

C. E. W. Dow, Atlanta, Ga.

Friction Clutches in Cotton Mills and the Philips Clutch.

THOMAS HENRY SMITH, Jamestown, N. Y.

Discussed by Messrs. WALTER E. PARKER, JOHN GREGSON, ARTHUR H. LOWE, GEORGE P. GRANT, Jr., and ROBERT MCARTHUR.

THIRD SESSION.

THURSDAY MORNING, APRIL 25, 1901.

Meeting called to order at 10 A. M., President THOMPSON in the chair.

The following papers were read:

Industrial Unity.
HERBERT E. WALMSLEY, New Bedford, Mass.

Possible Additional Economies at the Steam End of the Mill.
OROSCO C. WOOLSON, New York, N. Y.

Water Cooling Towers and Positive Steam and Oil Separating.
FRANCIS H. BOYER, Somerville, Mass.

Discussed by Mr. George I. Rockwood.

The Cloth Room; Its Arrangements and Needs.
ARTHUR F. GRAY, Boston, Mass.

FOURTH SESSION.

THURSDAY AFTERNOON, APRIL 25, 1901.

Meeting called to order at 2 P. M., President THOMPSON in the chair.

The following papers were read:

Report of the International Congress for the Unification of the Numbering of Yarn. Held at Paris, Sept. 3-4, 1900.

Translated by C. J. H. WOODBURY.

Discussed by Messrs. CHRISTOPHER P. BROOKS, ARTHUR H. LOWE, ARNOLD B. SANFORD and GEORGE OTIS DRAPER.

The PRESIDENT. Is there any other gentleman who will present any remarks upon this subject? If not, we will proceed to the election of members.

The SECRETARY. The Board of Government present with their approval the following names of candidates for membership:

FOR ACTIVE MEMBERSHIP.

NATHANIEL F. AYER, Asst. Mgr. Farwell Bleachery, Lawrence, Mass.
518 Beacon Street, Boston, Mass.
By Mr. A. M. GOODALE.

PETER H. CORR, Treas. Greenwich Bleachery, Taunton, Mass.
By Mr. D. M. THOMPSON.

WILLIAM J. CRAY, Supt. Aldrich Mfg. Co., Moosup, Conn.
By Mr. JOHN T. FYANS.

ALBERT DEABILL, Supt. Lowell Hosiery Co., Lowell, Mass.
By Mr. W. A. EASTMAN.

HENRY C. DEXTER, Agt. Greene & Daniels Mfg. Co., Pawtucket, R. I.
By Mr. E. R. RICHARDSON.

ROBERT DOW, Partner in Solway Mills, Westerly, R. I.
By Mr. E. R. RICHARDSON.

FREDERIC C. DUMAINE, Treas. Amory Mfg. Co., 64 Ames Bldg., Boston, Mass.
By Mr. ARTHUR H. LOWE.

CHARLES W. FISHER, Asst. Supt. Fisher Mfg. Co., Fisherville, Mass.
By Mr. A. W. DIMICK.

WILLIAM H. GREENE, Treas. Greene & Daniels Mfg. Co., Pawtucket, R. I.
By Mr. E. R. RICHARDSON.

WALTER B. HALL, Supt. Boston Duck Co., Bondsville, Mass.
By Mr. E. G. CHILDS.

A. E. HENRY, Mfr., Partner in Solway Mills, Westerly, R. I.
By Mr. E. R. RICHARDSON.

T. I. HICKMAN, Pres. and Treas. Graniteville Mfg. Co., Augusta, Ga.
By Mr. T. H. RENNIE.

CHARLES W. HUBBARD, Treas. Ludlow Mfg. Co., 133 Essex Street, Boston, Mass.
By Mr. CHARLES H. FISH.

OTIS L. HUMPHREY, Cotton Dept. Lowell Textile School, Lowell Mass.
By Mr. EDWARD P. DENNIS.

GEORGE A. HURD, Supt. Cocheco Mfg. Co., Dover, N. H.
By Mr. CHARLES H. FISH.

JOHN EDWARD LAWTON, Governing Director, American Thread Co., Matlock, Derbyshire, England.
By Mr. D. M. THOMPSON.

A. LAWRENCE LOWELL, Trustee, Lowell School of Design, 843 Exchange Bldg., Boston, Mass.
By Mr. F. C. MCDUFFIE.

FREDERICK B. MACY, Treas. Soule Mills, New Bedford, Mass.
By Mr. CHARLES M. HOLMES.

JOHN NEILD, Supt. Wamsutta Mills, Nos. 4-5, 8 Franklin Street, New Bedford, Mass.
By Mr. HERBERT E. WALMSLEY.

HENRY OSGOOD, Supt. Wm. A. Slater Mills Corp., Jewett City, Conn.
By Mr. WILLIAM P. MCMULLAN.

CHARLES H. POTTER, Supt. Montreal Cotton Co., Valleyfield, P. Q., Canada.
By Mr. FRED LACEY.

EDWARD B. TOWNSEND, Treas. Warwick Mills, 53 State Street, Room 632, Boston, Mass.
By Mr. JOHN ECCLES.

WILLIAM WHITMAN, Treas. Arlington Mills, 78 Chauncy Street, P. O. Box 3590, Boston, Mass.
By Mr. FRANKLIN W. HOBBS.

FRANKLIN D. WILLIAMS, Treas. Fiskdale Mills, 87 Milk Street, Room 21, Boston Mass.
By Mr. F. C. MCDUFFIE.

FOR ASSOCIATE MEMBERSHIP.

ARTHUR T. BRADLEE, Mgr. Cotton Yarn Dept., Harding, Whitman & Co., 78 Chauncy Street, Boston, Mass.
By Mr. FRANKLIN W. HOBBS.

JOHN O. DEWOLF, Mech. Engineer, 1012 Tremont Bldg., Boston, Mass.
By Mr. W. B. SMITH WHALEY.

FRED W. EASTON, Treas. Easton & Burnham Machine Co., 180 Weeden Street, Pawtucket, R. I.
By Mr. JOHN E. KENDRICK.

LEMUEL R. HOWE, Importer and Dealer in Dye Stuffs, Howe, Fuller & Trunkett, 92 State Street, Boston, Mass.
By Mr. ARTHUR H. LOWE.

JOHN MCCULLOUGH, Cotton Waste Merchant, New Bedford, Mass.
By Mr. C. P. BROOKS.

GEORGE I. ROCKWOOD, Mechanical Engineer, 62 Summer Street, Worcester, Mass.
By Mr. JOHN M. RUSSELL.

DWIGHT SEABURY, Mill Engineer, 12 East Avenue, Pawtucket, R. I.
By Mr. D. M. THOMPSON.

H. A. TILLINGHAST, Treas. Granger Foundry & Machine Co., Providence, R. I.
By Mr. D. M. THOMPSON.

CLEMENT A. WAKEFIELD, Selling Agt. Saco & Pettee Machine Shops, Biddeford, Me.
By Mr. ROBERT MCARTHUR.

The PRESIDENT. I will appoint as a committee to distribute, collect and count ballots, Messrs. SIDNEY B. PAINE and HENRY D. MARTIN.

The committee proceeded to the discharge of their duty, and reported later that they had attended to their duty and that the candidates had received 36 votes each, being the whole number of ballots cast, and were therefore declared by the President unanimously elected to membership.

Mr. ARTHUR H. GULLIVER. Mr. President, the following resolutions have been drawn up by the committee appointed at the second session yesterday:

Resolved, that the thanks of the Association be extended:

To His Honor, THOMAS N. HART, Mayor of the city of Boston, for his cordial address of welcome at the opening session, and his kindly interest in the aims of the Association.

To President HENRY SMITH PRITCHETT, of the Massachusetts Institute of Technology, whom we recognize as an educator of national reputation for technically training men for mechanical and commercial life, for his

able paper on, Is there a Place for a Profession in Commerce, and that we appreciate his efforts in this direction.

To the New England Telephone and Telegraph Company for their courteous treatment in allowing the members the free use of their lines during the sessions, and that the members thoroughly appreciate their kindness in making such provision for their convenience.

To the American Telephone and Telegraph Company for their courteous treatment in allowing the members the free use of their lines during the sessions, and that the members thoroughly appreciate their kindness in making such provision for their convenience.

To Prof. A. O. KITTREDGE, of New York University, for his able and exhaustive paper on Accounting for Cotton Mills.

To Mr. OROSCO C. WOOLSON, of New York, for his interesting and suggestive paper on a most important part of mill engineering the Possible Additional Economies at the Steam End of the Mill.

To Mr. FRANCIS H. BOYER, of Somerville, Mass, for his able paper, thoroughly appreciated by the members, on Water Cooling Towers and Positive Steam and Oil Separating.

To The Boston Society of Civil Engineers for their courteous hospitality in affording the Association the use of their rooms for committee meetings.

To Mr. H. C. SPAULDING of the American Stoker Company, for his kindness in providing for the members and their friends special cars to conduct them to the United States Navy Yard at Charlestown to witness the operation of the American Stoker, and for the courtesy of Rear Admiral W. T. SAMPSON for his permission to visit the Olympia and other points of interest.

FREDERICK A. FLATHER,
A. H. GULLIVER,
O. W. TRUESDELL,
THOMAS G. COX,
CHARLES D. ROBINSON,
Committee on Resolutions.

On motion of Mr. ROBERT MCARTHUR, duly seconded, the foregoing resolutions were unanimously adopted.

Mr. ROBERT MCARTHUR. Mr. President, if it is not out of order, I would like to say just a few words in regard to the next semi-annual meeting of this Association. While I know that this matter rests with the Board of Government, who are abundantly competent to decide all matters that may come before them, I simply want to make a suggestion. I have been informed that the next meeting is to be at Buffalo, so that the members may have the opportunity of attending the Exposition. It seems to me that rather than to have the meeting in October, at the tail end of the Exposition, it will be much better to have it, say, a month earlier.

The PRESIDENT. It think it is arranged for September. The Secretary will give you the date.

The SECRETARY. Yes, it is the last Wednesday and Thursday of September, the 25th and 26th.

Mr. ROBERT MCARTHUR. Oh, I beg pardon; I did not know the fact. I simply wanted to make the suggestion.

The PRESIDENT. The same thought was had by the Board of Government, that the month of September would be pleasanter for the members and their friends to visit the Pan-American Exposition.

The SECRETARY. I am very glad that the ex-President opened the question, because it gives an opportunity to make a statement in regard to the arrangements for that autumn meeting. Buffalo has few hotels for such a large city. It has one superior hotel and a great many other good hotels, and they are all full under ordinary circumstances. Therefore a great number of the people who go to Buffalo will have to be put up in boarding houses or take lodgings where persons will let two or three rooms, and then obtain meals at restaurants. We found that there was no prospect of procuring accommodations sufficient for the Association in one hotel, but through the parties

who attend to the transportation arrangements on those excursions, or who have done it in the past, we found that we could get fine accommodations at the International Hotel at Niagara Falls; that frequent trains, are to run, I think every 15 or 30 minutes, from Niagara Falls to the fair grounds. In point of time one can go quicker from Niagara Falls to the fair than from the center of Buffalo to the fair by the street cars, and all persons agree that it is more comfortable. Several Buffalo people agreed with me on the subject, and that was considered a recommendation for the plan. The final action, of course, under our constitution and by-laws, rests with the next Board of Government.

The committee, for nomination of officers for the ensuing year made their report, presenting the following candidates for the several vacancies to be filled at this meeting:

For President,

CHARLES H. RICHARDSON,	Clinton, Mass.

Vice Presidents,

GEORGE H. HILLS,	Fall River, Mass.
CHARLES H. FISH,	Dover, N. H.

Directors.

For three years.

GEORGE F. WHITTEN,	Manchester, N. H.
W. B. SMITH WHALEY,	Columbia, S. C.

For two years.

WILLIAM D. HARTSHORNE,	Lawrence, Mass.

The PRESIDENT. Preparatory to the election of officers, I will appoint as a committee to distribute, collect and count the ballots, Messrs. ARTHUR F. GRAY and GEORGE W. WEEKS.

The committee proceeded to the discharge of their duties and subsequently reported that all the candidates above named had

received thirty-five votes, the whole number cast, and the President declared the nominees on the ballot elected.*

Overseers and Overseeing.

CHARLES W. DENNETT, North Adams, Mass.

Discussed by Mr. ARNOLD B. SANFORD.

Some of the Troubles to Manufacturers arising from Dyed Yarns.

FARQUHARSON J. MUIR, Milltown, N. B.

Discussed by Mr. CHARLES W. DENNETT.

A Little Study in Lug Straps for Broad Drop Box Looms.

FRANK P. VOGL, Claremont, N. H.

The SECRETARY. The trip to the Navy Yard, it will be remembered, according to the programme, will start in the street cars on the surface — not on the underground or subway, on Scollay Square at the head of Brattle Street, at the end of Tremont Street, at 4 o'clock, and those who wish to go will please obtain their tickets from the young man at the desk in the entry.

The PRESIDENT. Gentlemen, have you any remarks to offer concerning the paper just presented or other suggestions before we adjourn? . . . If not, I have just a brief word to say in parting.

* Mr. CHARLES H. RICHARDSON declined to accept the office of President, and on May 18, 1901, the Board of Government filled the vacancy, in accordance with Article 9 of the Constitution and By Laws, by electing as President, Mr. CHARLES H. FISH, Dover, N. H., and filling the resulting vacancies by electing Mr. HERBERT E. WALMSLEY, of New Bedford, Mass., second Vice President, and Mr. JAMES R. MACGILL, Pawtucket, R. I., a member of the Board of Directors.

PRESIDENT'S CLOSING ADDRESS.

With the close of this convention, my official relations with this Association cease. It has embraced a period of interesting and pleasant events. Its memories I shall ever cherish with grateful remembrance. I have for many years enjoyed the pleasure of a large circle of acquaintances among the members of our Association and of many others connected with the cotton textile industries throughout the country — a condition which has justified a feeling of pride and interest I cannot well express. Of late, however, this acquaintance has extended and the feelings of interest in your affairs, as also the friendships, have grown and strengthened until I am more seriously impressed than ever before with the intrinsic value of these mutual relations.

I hold in high esteem and with a sense of earnest appreciation the honors I have received at your hands. I therefore desire to express to you my sincere thanks for the courtesy and pleasant attentions I have received from all of you during the period of my official terms as your president. I have had less time to give to matters concerning your interests than I could wish. I have felt a deep interest and have contributed to them so far as I have been able. I am conscious that there is very much work that needs to be done. The interests represented by the members of this Association are of vital import, not only to those immediately concerned, but to the communities and sections within which they are located, and finally to the country as a whole. It is a question of grave importance and demands your serious consideration. Whatever course you may devise will require considerable time in the initial work preparatory to

such methods and systems as the occasion demands. It will involve an increase of clerical force and extended responsibilities for the officers and Board of Government of the Association. The expenditure necessary to the accomplishment of this work will be moderate as compared with the results which will be achieved.

There is another thought which I desire to again refer to in closing, that you will all consider carefully the question of a more general participation in the discussion of the papers and topical questions. I know that there are very many who can easily do so. I know also that their experience and knowledge would prove of incalculable value to the work of the Association. As I have also before suggested: It is greatly to be desired that more papers may be presented upon questions concerning the material, machines, process and products of the mills than have been heretofore.

The Board of Government and Secretary have at times found some difficulty in securing the papers upon subjects desired. It is therefore important that members shall give due and fair consideration to the requests that may be made to the end that all shall contribute a reasonable service to the interests of the Association.

There is another phase of your business worthy of consideration. Under the present system the papers are supposed to be sent to the Board in time to be printed and distributed to the members for their perusal and careful study, as a means of preparation for discussion at the meetings, after the formal presentation by the authors. This method is theoretically correct, but it is practically inoperative in our practice, for the reason that the discussions do not follow.

We may naturally suppose that members will examine all papers received and select for most careful consideration and study those which touch questions of most concern to them. Now, if this course were followed to its logical or desired result, and the members were prepared to participate in the discussions of the several subjects, it would at once appear that time would be

inadequate; hence a less number of papers would suffice or the present method would have to be changed.

We may assume from our experience that the papers presented possess great value. They represent the careful thought and study of authors whose services are entitled to most respectful consideration. On the other hand, we cannot forego the desire of securing the interchange of opinions of the members, which is possible only through discussion. Assuming that we may realize in full the latter and yet attain the largest measure possible of the former, I suggest for your consideration that papers shall be presented by title only. The author in his introduction of the subject to the convention prepares the way for the interrogations and discussions, which may then follow more naturally and with greater interest than at present. This course will save very much of your time and insure a better preparation through reading of the papers before entering the convention.

There is another view of the matter which may be suggested. The remark has been made by some, indicating a dislike to have their papers printed and distributed in advance of their presentation at the meetings; evidently desiring that the thought which they present in person, through the reading, should be entirely new to the convention and occasion.

If such a course as this were recognized, it would necessarily involve the system of passing the papers after presentation, to the next convention, in order that members could prepare themselves for discussion. As opposed to this method may be urged the point that many of the questions are especially applicable to the immediate present. The Association, however, would be in possession of the papers and the members have every advantage except that due to the discussion.

Some features of this latter plan are pleasant, and possibly desirable. The first, however, is probably the more practicable. Confirmation of this appears in the experience and practice of our colleague national organizations, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American

Institute of Electrical Engineers. These associations print their papers in advance for general distribution for the purpose of securing discussions which are directly in line with the papers, and also to secure accurate abstracts in the technical press. The results of this method are represented as eminently satisfactory.

You desire to accomplish the largest amount of work possible in the limited time you have allotted for this service. You want as many good papers as can be procured, and to the end that you may realize in the fullest measure the value of their material it is necessary that you shall do all in your power by personal contribution and influence to secure a liberal discussion of every question which may be presented for your consideration.

I believe that you have before you the promise of a bright and prosperous future. This Association has assumed a position in behalf of the cotton textile industry of the country which imposes a great responsibility. You stand before the people as a power of commanding influence. You are recognized by the vast financial interests of the country which represent innumerable vocations of industrial activity. You cannot, if you would, escape the burden of this responsibility. Your work, however selfish or personal it may appear to some, is not unto yourselves alone. It is a contribution of incalculable value in the interest and advancement of all human progress. The rewards for your service are sure and the remittances in compensation therefor will keep steady pace with the progress of your achievement.

Gentlemen, you have this day elected as your next president, Mr. CHARLES H. RICHARDSON of Clinton, Mass. I congratulate the Association upon its choice. Mr. RICHARDSON comes to the position with large experience in the Board of Government. He is an able and most estimable gentleman, and I bespeak for him and the Association the full measure of pleasant relations which I have received at your hands. I regret that Mr. RICHARDSON is absent this afternoon as it would have given me much pleasure in presenting him in person. I therefore bid you adieu with many thanks for your kind consideration.

Mr. ARNOLD B. SANFORD. Mr. Secretary, I think it would be in order at this time to pass a vote of thanks of members of this Association to our retiring President for his faithful services, and I make that motion.

The motion was seconded.

The SECRETARY. You hear the motion of thanks to the retiring President for his faithful services. The motion has been seconded. Are you ready for the question? [Putting question.] It is a unanimous vote, sir.

The PRESIDENT. Gentlemen, I thank you for your formal expression of approval and kind feeling. The business of the convention being now over, I will announce an adjournment *sine die*.

Adjourned,

Attest:

C. J. H. WOODBURY,

Secretary.

THE EXCURSION.

After adjournment of the Thursday afternoon session, a number of members made an excursion to the United States Navy Yard at Charlestown, by invitation of Mr. H. C. SPAULDING, New England Manager of the American Stoker Company. The party found special cars in waiting, and made the trip to the Navy Yard over the surface lines of the Boston Elevated system, the return trip being made by the subway. In spite of rain, the intended programme was carried out to the letter, including inspection of the excavation for the new dry dock; making of large anchor chain in blacksmith shop, and inspection of the boiler plant of the Steam Engineering Department, which is equipped throughout with American Underfeed Stokers.

Through the kind permission of Rear Admiral SAMPSON, the party was then allowed to inspect the cruiser Olympia, and the old frigate Constitution, returning to Boston a little after six o'clock.

TRANSACTIONS.

FIRST SESSION.

WEDNESDAY MORNING, APRIL 24, 1901.

The Association met in Chipman Hall at 11 A. M., President THOMPSON in the chair.

This session was devoted to

Welcome to the Association.
His Honor, THOMAS N. HART, Mayor of the City of Boston.

Address—Is There a Place for a Profession in Commerce?
HENRY SMITH PRITCHETT, Ph.D., LL. D.,
President Massachusetts Institute of Technology.

President's Address. D. M. THOMPSON, Providence, R. I.

Report of the Secretary and Treasurer.

As recorded in the Proceedings.

SECOND SESSION.

WEDNESDAY AFTERNOON, APRIL 24, 1901.

The Association met in Chipman Hall at 2 P. M., President THOMPSON in the chair.

The PRESIDENT. You will please come to order. The next subject to be presented to you is: A Modern Textile Machine Building Plant, illustrated by the stereopticon, by Mr. H. G. MCKERROW, of Boston. (Applause.)

A MODERN TEXTILE MACHINE BUILDING PLANT.

By H. G. McKerrow, Boston, Mass.

In the last most remarkable century of mechanical and scientific advance in all lines of endeavor connected with the better living and improvement of the human race, perhaps none shows more remarkable results to one who knows the inner facts than the production of textile machinery. Particularly is this the case in the last two decades of the century. While the fundamental principles of the machinery used to produce the wonderful filaments and fabrics now so lavishly committed to our use may not have changed much in the last twenty years, the method of producing these appliances has been revolutionized in that time.

The days of the old fashioned mechanic, whose brain and nerves were in his finger tips, has passed. The "chipping" and "filing" and "fitting"; the "setting out" and "measuring" and "prick punching" of even a few years ago are becoming obsolete, and the age of "jigs" and "templates" and "automatic tools" is with us, and each day extends their use, and adds to the enormously increased possibility of output of the modern machine shop.

The uncertainty of producing exactly the same item of machinery twice alike, to say nothing of its unlimited production to identical dimensions, has been largely done away with, and now a certain part of any given machine may be produced by itself and sent thousands of miles away to find its exact resting place in a machine, built, perhaps, years before.

The systemization of machine building has led not only to this uniformity of detail, and the increased production of machinery, but to its greatly decreased cost. The cost of labor is becoming an item of less and less consideration; the high priced skilled mechanic is no longer, in the same sense, in each department of a machine shop, the indispensability he was a few years ago. I have myself known in machine shops some years ago, of some delicate piece of lathe work, or some complicated piece of moulding, having to wait for days for the return of some particular machinist or moulder from an attack of sickness or a prolonged spree, as it could not be entrusted to any one else. Now the automatic machine, or the plate moulding machine, has changed all that, and a man with sufficient intelligence to understand the operations of these ingenious appliances is all that is required.

Today, the heart of a machine shop is the tool room. So long as this organ of the body mechanical is kept well regulated and in order, so long will the other limbs fulfill their appointed functions. It is here where the skilled mechanics are required; it is here where the tools are made, and kept uniform for given purposes, where the various template sizes are kept invariable year in and year out. The drills that are handed out to the mechanics for drilling certain holes; the milling cutters which are arbitrarily distributed for given purposes; the gauges by which certain constant dimensions are secured; are made and kept in order in this department. If a milling cutter, or a special planing tool becomes dull under use, the machinist is no longer supposed to take it to the shop grindstone himself, and grind a little bit off this side, or a good deal off the other. He must return it to the tool room and receive another in its place.

The steel rule and the inside and outside caliper, which were as the breath to the nostrils of the old time mechanic, are no longer a necessary part of the personal equipment of the modern man. His measuring and gauging is done for him from an authorized centre, and his business is simply to make the fullest and most correct use possible of the tools he is supplied with, and with this done, his personal responsibility ceases.

So also in a modern foundry, the long rows of benches with moulders tamping and scraping and sifting, each at his own individual flask, are no longer to be seen (at all events to anywhere near the same extent as formerly). Instead we see strange looking machines, all cranks and hand levers and foot levers, which are looked after, perhaps, by one man and a boy, and which, with a few whirls and turns and thumps, turns out hundreds of perfect moulds in the same time it used to take single moulders to turn out one, or at the most, a gang of ten or twenty.

No longer is it necessary for a moulder to call half a dozen other men away from their work to help him to turn over his flask, or to help him pour his mould from a 150 pound ladle. With a hiss and a snort, a hydraulic crane comes along and grapples the occasion, and in a twinkling the task is accomplished.

Another system which has led to a greatly increased production of machinery parts and which has been made peculiarly possible by the above mentioned machine shop practice, the piece work method of payment, an elaborate system, by means of which each man is paid according to what he produces, is now commonly used in modern shops, and one man produces on a specially arranged tool, week in and week out, one single part by the dozen, the score or the hundred, and his weekly wage is fixed in relation to this. Not only does this method immensely increase the production, but it also increases very materially the weekly wages of the men.

It is customary in this country to contrast the wages earned by English machinists with those earned by American men, to the disadvantage of the former, but every modern English shop can show many instances of men who earn, on a piece work basis, anywhere from $12 to $25 per week.

The particular machine shops which it is my purpose to describe today, are those of Messrs. Tweedales & Smalley, of Castleton, near Manchester, England. The three gentlemen constituting this firm were for many years connected with the well known firm of Messrs. Howard & Bullough, Accrington, England, and after the death of Mr. JOHN BULLOUGH, they de-

cided to build and equip a machine works of their own. Their method of selecting a site was a somewhat novel one. Realizing that a position as nearly central as possible with relation to the cotton manufacturing districts of England was advisable, they drew a circumferential line through the extreme cotton manufacturing towns, and found that the geographical centre of this brought them to a point between Manchester and Rochdale.

Here they were fortunate enough to find a satisfactory piece of land, while the facilities for both rail and water carriage were unusually good. The Lancashire and Yorkshire railway, reaching all parts of Lancanshire and Yorkshire and connecting with seaport towns on both the east and west coasts of England, runs directly through the place, while the Rochdale canal, one of those remarkable waterways with which England is networked, runs parallel thereto.

Here, therefore, in February, 1892, the first brick was laid for the new machine shops, and the start was made on a plant which, with the original buildings and the many additions which the growing business has made necessary since, now covers 14 acres of land.

The first view I propose to show you is the front view of the works.

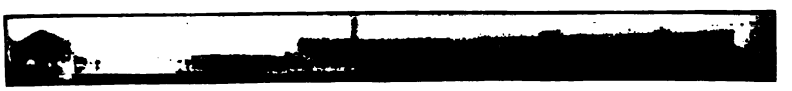


FIG. 1.—EAST VIEW OF WORKS.

This building is 760 feet long, while its greatest depth, which is not uniform, is 576 feet. The railway runs immediately in front of this, and the siding extends from the main line into the works. All the switching in the yard itself is done by an electric motor car.

FIG. 2.—SOUTH VIEW OF WORKS.

Since the building of the shop was commenced, the surrounding land to the extent of over 60 acres had been acquired, so that there is room for an almost unlimited growth.

FURNACE CHARGING STAGE.

From this we come directly into a part of the works, where a portion of the building is sunk below the general level, and in

FIG. 3.—FURNACE CHARGING STAGE.

front of the building proper. The tracks run in upon the roof of this portion, while between the tracks grids and trap doors open into the various storage chambers for sand, coal, etc.

Thus the cars containing these supplies can be run into the destined point, and deposited through the bottom of the specially built car into the proper store. The platform seen in the picture is on a level with the charging door of the furnaces, and thus the pig iron and coke brought by the cars can be dumped on the stage in immediate proximity to the furnace door.

The gases from the furnace are discharged into the square tower shown, and all the ashes carried by them drop into the bottom by gravitation.

FOUNDRY.

Directly from this stage we pass by a platform elevator into the foundry. This foundry now covers 2¼ acres of land. The

FIG. 4.— MOULDING.

main building is 360 feet long by 234 feet wide, and is 23 feet clear from the floor to the roof beams. There are three furnaces having a melting capacity of over 100 tons per day.

This is covered by a steel and glass roof, and by a thorough system of exhaust fans the fumes and vapors which are inseparable from foundry work are in a large measure avoided. The lofty height of the room enables the atmosphere to be kept as

clear as in a machine shop. After the castings are cooled they pass through the dressing machines, and here they are cleaned by the Tilghman process. This consists of a blast process, by means of which, under a tremendous pneumatic pressure, finely granulated particles of chilled iron are blown against the surfaces of the castings, and the burnt sand and scale which adheres to the surface is completely cleared off in a few seconds of time. This simply requires the services of one or two men to hold an exaggerated form of hose pipe, with a large nozzle, and does away almost entirely with the old time method of brushing and cleaning the castings and the commonly used method of pickling also is no longer requisite in this process.

Many of the moulding machines in this foundry are made by a well known firm of makers of these appliances, but the larger number are made in the machine shops of Tweedales & Smalley themselves, and are specially designed for their own particular work. A very complete system of annealing ovens is used, but these are of the ordinary type and need not be specially described. The work in the foundry is almost entirely on a piece-work basis, and the wages earned by some of the men under this system go into very respectable figures and will compare well with the wages made by American moulders. Iron patterns are almost exclusively used, as they are constantly being moulded from, and they are, therefore, more desirable in that they keep the form more constant than would be the case if wood patterns were used.

CYLINDER MOULDING.

This part of the foundry is used exclusively for the moulding of card cylinders and doffer cylinders. These are moulded in a circle and end up, with an extra large "git" on the top to insure a clean casting. This " git " is subsequently cut off on specially arranged machines. An electric crane is in use in this part of the shop for lifting cylinders and for carrying the molten metal from the furnace to the mould.

FIG. 5.—CYLINDER MOULDING.

TIMBER STORE.

This is where all the timber is stored on arrival from Canada and elsewhere and from this place it is distributed to the carpenter and pattern making shops. In all, including the timber that is used for making packing cases, there is used in this shop about 2,500 tons of timber per annum.

PATTERN MAKING AND WOOD WORKING.

The next view we come to shows the room where all the pattern making and wood working is done. This does not vary from the same kind of a room in other shops, except that here again the very latest tools and appliances are employed.

MAKING PACKING CASES.

The next room is of special interest to mills in this country, as it is here where the complete system of making packing cases is carried out. This is really one of the most important depart-

ments of the work, as the cases have to be designed for their contents, so that these will take up as little space as possible and yet be so stayed and locked in the cases as to preclude as far as possible the possibility of breakage in the many handlings through which they have subsequently to go. A specially trained class of carpenters is employed on this work and it is not a job that any ordinary man can readily undertake without previous training.

From these rooms we begin to pass into the machine shop proper, and to see how the castings from the foundry are distributed through the various machine tool rooms. The parts of the machines are produced by the thousand and each individual item perfectly fits corresponding parts turned out from machines in other parts of the works. When they are finally assembled, although they have never seen one another before, their mutual adaptation proves to be perfect. No time is wasted in rendering the adjustment more perfect; any attempt to do so would impair the perfection already attained. When the parts are finished they are immediately placed in the stores, each in its respective section and all carefully numbered and labelled, so that when a machine is put on the shop lists it is only necessary to pass in the requisite orders through the different departments to the stores, when almost immediately the necessary finished parts are at once sent into the erecting shops.

TOOL MAKING AND REPAIRING.

By far the most particular room that we have to consider in this connection is the tool making room, and it is here where all the standard sizes of the shops from the largest to the smallest are kept constant. It is here also where all the milling cutters, lathe and planer tools are made and kept in proper condition. It is here, also, where the most expert mechanics are employed and it is in their care that the entire system of the machine shop as regards the duplication of parts to exact dimensions is consigned. A great many of the tools in this room, as well as in the next room which will be shown, are of American manufac-

ture. In this connection, I may say that there are in these shops upwards £10,000 worth ($50,000) of the American ma-

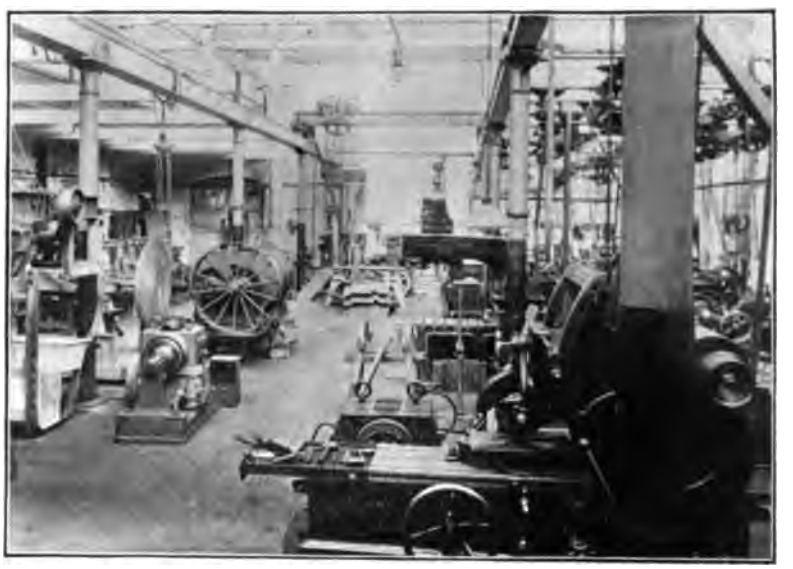


FIG. 6.—TOOL MAKING AND REPAIRING.

chine tools. I would call your especial attention to the machine in the foreground of the picture, by the side of which you will notice a magneto machine; you will also notice on the bed of the tool certain V shaped lines, under the grinding wheel. This is a powerful electro-magnet which is excited by the above mentioned magneto machine. This is used for certain fragile and delicate pieces of machinery which, if they were to be clamped down on the bed of the tool would be pulled out of shape. They are, therefore, simply laid on the magnet, the switch is turned, and they are forthwith held down perfectly true at all parts by the electric current and in this position are passed back and forth under the grinding wheel until the requisite work is done.

A very complete system is employed with regard to keeping the sizes constant throughout the shop. There is a master set

of templets kept sealed in the office from which the tool shop set and working templets for the shop are periodically tested, and except at such times as these tests are being made the master set of templets is not employed, but is simply kept as a standard for reference and correction. From these templets all the gauges and templets which are used by the machinists are made, and on each gauge both for turning and drilling, two sizes are given, the one being a microscopic fractional part of an inch larger than the required size, and the other being the same amount smaller. Thus far the machinist, if he turns his stud or shaft to a diameter where the one size will *not* fit on, the stud is too large; if he turns it to a size where the other gauge *will* go on, the stud is too small and is spoiled. The same thing applies to the drilling of holes; if one size of the templet will not go in, the hole is not large enough; if the other end of the templet will go in, it is too large. By this means all sizes are kept within $\frac{2}{1000}$ of an inch.

FIG. 7.—MILLING AND WHEEL CUTTING.

MILLING AND WHEEL CUTTING.

It is only necessary to run hurriedly through this room and the two following ones, although it is in these rooms where the bulk of the machine tool work is done. One thing that will be noticed in all these rooms is that they are lighted entirely from the top, there being no windows on the side. Of course, this indicates a shop which is one story throughout, and with the exception of the screw making room this will be found to apply to the complete plant.

PLANING.

This next view shows the planing machines on which you will see card frames clamped up, in gangs of three or four at a time

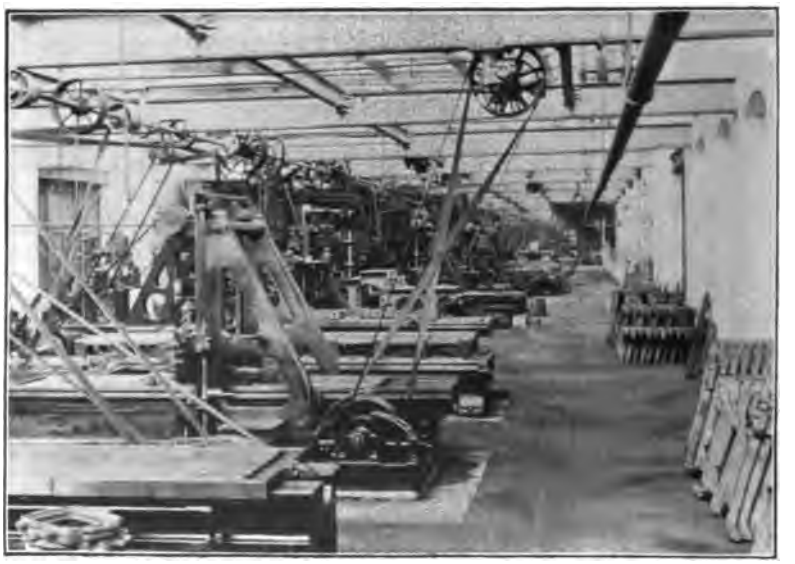


FIG. 8.—PLANING.

and having the various surfaces properly planed by especially arranged tools. These machines call for no special mention although several of them were made in this country.

TURNING DEPARTMENT.

In this room will be found a splendid array of the most modern appliances for turning. It is in this room, perhaps, where the great advantage of the roof light is best seen, and it will be readily understood how popular this is with the mechanics who work in this room. No shadows are thrown on their work and they are thus enabled to work not only to the best effect but also with increased speed. As the entire work of this room is done on a basis of piece-work this is an especial help to the men. On the right of the room will be seen the machines for

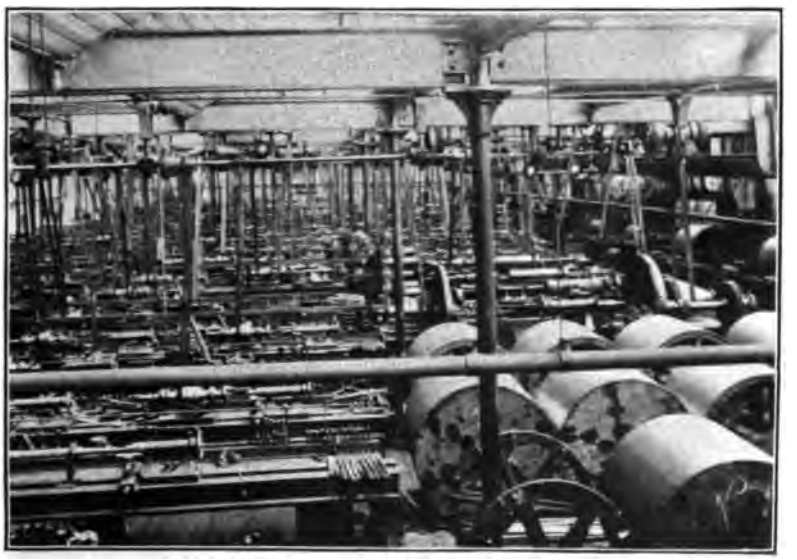


FIG. 9.—TURNING DEPARTMENT.

turning and finishing the large cylinders for revolving top flat cards. These are specially designed machines, and the heavy cylinders are revolved by frictional rollers.

SMITHY AND SHAFT SLIDING.

The next room is where the wrought iron work is done, and a most complete set of bar straightening machines, hammers

and cutting-off machines are here kept in busy employment. One gets an idea of the enormous power of modern machine tools, better, perhaps, in this room than anywhere else. One sees huge bars and sheets of iron instantly cut into lengths and shapes as if they were paper under the administration of a pair of scissors.

GRINDING AND GLAZING.

We now come to a very interesting room and one in which the greater portion of the bright finish, which is so characteristic of

FIG. 10.—GRINDING AND GLAZING.

English-built machinery, is acquired. There is a considerable difference of opinion between English and American machine shops with regard to finishing up machinery. In England it is believed that a bright finish not only looks better but enables the machinery to be kept cleaner, while in America a much more extensive use is made of the paint pot. One of the most

remarkable things about this room is the success which has been attained in getting rid of the dust from the wheels and in keeping the atmosphere pure and sweet. Under the floor and running at the back of the glaziers is a pipe, and in this is an opening at each glazier. In the centre of the shop a tube runs to the roof and this is connected with a receptacle which collects the dust and allows the air to escape. The air is of course drawn into the pipe at each of the glaziers, and there are two large fans which take about 12,000 feet of air per minute from a room which has a capacity of 231,660 cubic feet, Thus the air is completely changed in this room about every 20 minutes.

RING TURNING AND FINISHING.

We now come to a department of the works where the small work is done. In the room before you is where the rings are

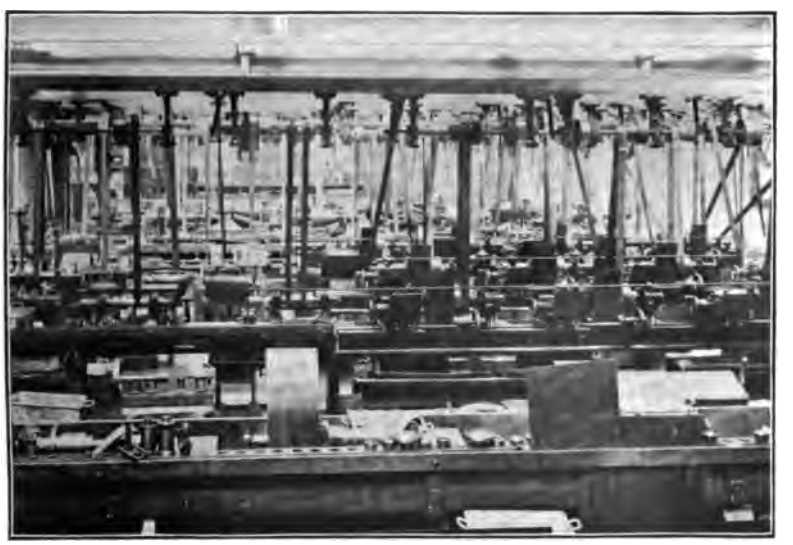


FIG. 11.—RING TURNING AND FINISHING.

made for the ring spinning frames. These are all specially designed tools and here again the work is entirely piece-work.

RING SPINDLE DEPARTMENT.

This room runs more or less in conjunction with the previous room, as this is where the flexible self-balanced spindles are made. From this room and the previous one, upwards of 350,000 rings and spindles are turned out per annum.

FIG. 12.— RING SPINDLE DEPARTMENT.

SCREW MAKING.

This room is chiefly remarkable from the fact that it is the only room in the works, with the exception of the offices, which has side light, and also for the fact that most of the tools in this room are of American manufacture. The form of many of these tools will be recognized by those familiar with them as being of the well known make of Pratt & Whitney of Hartford, Conn. In the view of this room, as of the other rooms, no men are shown at work for the reason that these views were taken on a Sunday.

In this room, however, even when the work was in full blast, there would hardly be more sign of life than there is at present.

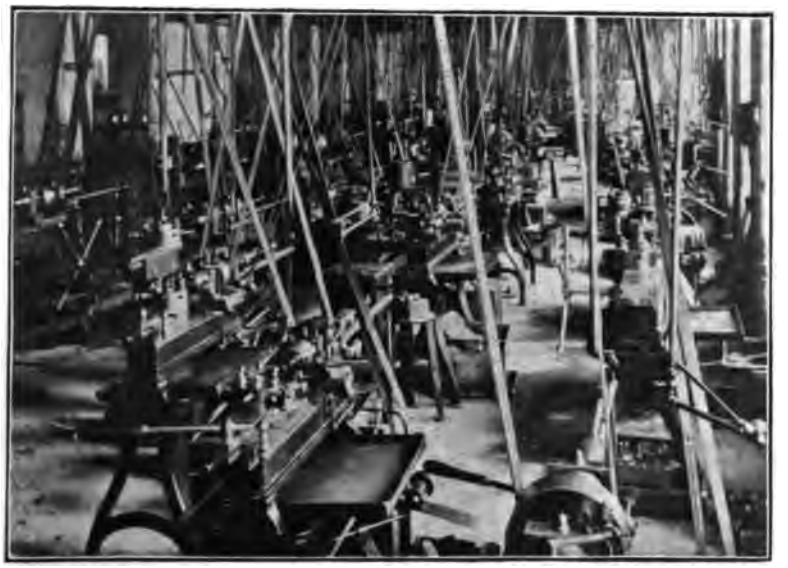


FIG. 13.—SCREW MAKING.

These machines are almost entirely automatic, and it seems little short of marvellous that aggregations of steel and iron can be made to be almost thinking intelligences, for that is what they appear to be.

A bar of iron is fed in automatically through the headstock of one of these tools, and is clamped in an automatic chuck when the requisite length is extended; and an automatic headstock slides up, turns up the shank, cuts a thread, shoulders the neck, chamfers the edge, and finishes up the head and finally after the expiration of a very few seconds in doing all this, cuts off the finished screw and drops it into a basket, while the chuck opens and another requisite length of iron or steel is fed through. The room practically runs itself and looks like a collection of fantastic and supernatural beings working busily in producing the unexpected and varied forms of steel and iron without any assistance from human beings whatever. The work in this room also is entirely on a piece-work basis.

CLOTHING AND GRINDING FLATS.

This room is where some of the most delicate work in the shop is done. This is where the cast iron flats for the revolving top flat cards are ground and brought to an exact surface and where the card clothing fillets are clamped and ground so as to enable the obtaining of the niceties of fine setting which are requisite in a cotton mill. Both the flats themselves and the fillets after they are attached are tested by electrical contact, and if there

FIG. 14 — CLOTHING AND GRINDING FLATS.

is so much as one wire which is longer to a microscopic degree than another the tell-tale bell will reveal its presence and enable the grinder to detect the fault. In another part of the room the flats are fastened together in the form of an apron and are ground in the same position in which they work. The fillets are well fastened on the flats by an improved steel clip, and the old fashioned method of riveting is no longer employed.

ERECTING FLAT CARDS.

We now come into a room where the manifold parts which have been made in the various departments we have passed through, begin to be brought together and to show in the result the completed machine. Heretofore. everything to an unpracticed eye has shown an heterogeneous mass of confusion, and we have seen parts of machinery of all sizes and shapes being produced which have apparently no relation with each other. We now begin to realize the purpose which has been steadily carried out through the different departments and the finished parts being to drop into their appointed places, and to

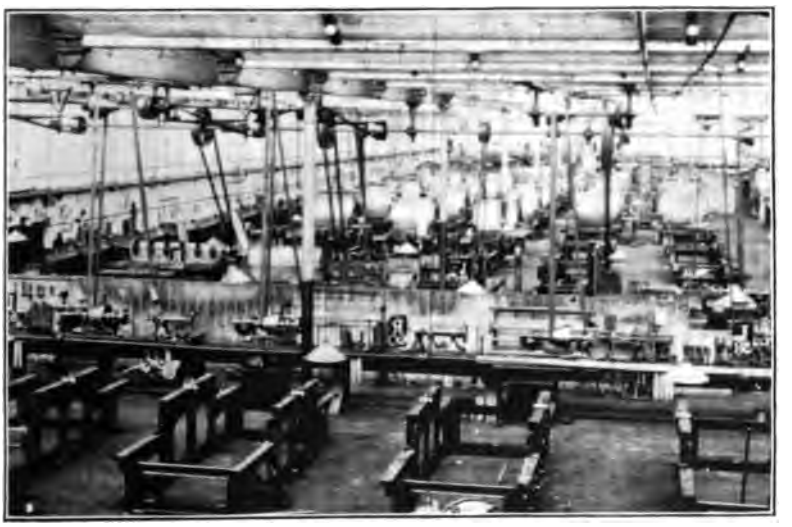


FIG. 15.—ERECTING FLAT CARDS.

embody a finished idea. On the floor of this room there are erected at one time 46 revolving top flat cards. Written orders are given to the men and the various parts are passed out to them from the stores, together with any particular instructions intended to comply with the requirements of individual customers, and each machine is given a shop number, which number appears on the machine side and by means of which the machine can always be identified with the written particulars filed in the

shop even though the machine was built 10 years previously and has been running in a mill 10,000 miles away from home.

ERECTING DRAWING, SPEED AND RING SPINNING FRAMES.

The next room carries out this idea of the creation of complete machines to a still further extent, and it is here where the drawing, speed and ring spinning frames are made. The same particulars apply in the case of these machines as applied in the case of the cards and the same method of assembling and keeping a record is employed. In this room there is a minimum capacity

FIG. 16.— ERECTING DRAWING, SPEED AND RING SPINNING FRAMES.

on the floor at one time of 6 drawing frames, 31 speed frames and 23 ring frames, while the minimum turnout of the complete shop per week of finished machines is about 15 ring frames, 16 speed frames, 3 drawing frames and 22 cards, making a total finished product of 56 finished machines per week.

PACKING MACHINERY FOR EXPORT.

The next room is where the machinery is all packed in specially prepared cases for export. This room is provided with an electric crane which hoists the packed and finished cases, after they are properly marked, put on the freight cars for shipment, and from here they are distributed not only throughout England but to France, Germany, Russia, Norway, Sweden, Spain, Portugal, Austria, Italy and even Greece in Europe; to the United

FIG. 17.—PACKING MACHINES FOR EXPORT.

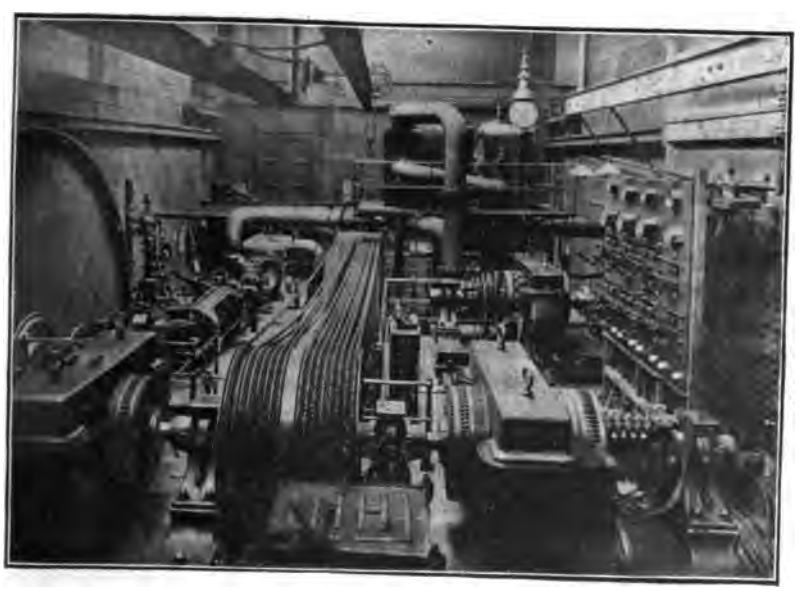


FIG. 18.—ENGINES AND DYNAMOS.

States, Canada, Mexico, Brazil and elsewhere in America, and to India, China and Japan in Asia.

ENGINE ROOM AND DYNAMOS (TWO VIEWS).

The next two views are interesting views as showing a very complete power plant, together with dynamos and switch board for electric lighting as well as for power. The total power used in these shops is about 1,000 horse power, of which 750 horse power is electrical. These engines and dynamos are of the most modern and approved types and it will be noted that the well known English principle of rope driving is employed. The engines are of the triple expansion marine type.

ELECTRICAL STORAGE BATTERY.

This last view of the interior of the works shows a very complete system of electrical storage which is used to help out when

FIG. 19.—ELECTRICAL STORAGE BATTERY.

the dynamos are overloaded. The motors in the different departments of the shop can also be run from this storage battery, which also supplies the lighting during the night as well as the electrical power required by the cars on the siding in front of the building for switching purposes, which was shown in the first view. It also provides the current for the driving of the cranes, hoists, etc., throughout the entire works.

The entire number of men employed in these works is from 1,800 to 2,000 according to the condition of business, but this number will be very soon increased, as not a year has passed since the shops were built without material additions being made to the plant. I may say that among this number, at the present time there are no trade unionists, and there is no restriction arbitrarily established by the unions with regard to the amount of work a man shall do, nor the class of work he shall do, nor the question as to the employment of apprentices or any other of the vexatious questions which the labor unions undertake to dictate not only in England but in this country.

Views of the works from the north, east, south and west are also shown.

FIG. 20.—WEST VIEW OF WORKS.

BOWLING GREEN AND BILLIARD CLUB.

This is a club house just above the works which the firm built primarily for the use of the men, although the membership is not limited to the employees of the works. There is every facility provided here for inside and outside recreation; there is

a large and well lighted billiard room, and the view shows a beautiful bowling green where the popular English game of lawn bowls is played.

FIG. 21.—BOWLING GREEN AND BILLIARD CLUB.

Mr. C. J. H. WOODBURY. Mr. President, before anybody else joins in the discussion I would like to ask the speaker if there are any difficulties arising from the weight of snow on such very large and extensive roofs—whether it is necessary to use steam jets to remove it.

The PRESIDENT. Mr. MCKERROW is not in the room at this moment.

Mr. THOMAS HENRY SMITH. If I may answer the question, there is no trouble with snow on roofs in England. I had a shed that contained eleven hundred looms with a saw-tooth roof, such as Mr. MCKERROW showed, and the snow does not lie there to do any harm. It generally melts about as fast as it comes.

Mr. H. G. MCKERROW. There is comparatively so little snow in England that we are not bothered with it to any degree, and such as does lodge on the roof, we find, blows off. If anybody can give me any reason why it does, I should like to have him; but as a matter of fact, it blows right out of the saw-tooth roof. It seems as if there was a little eddy of wind that scoops it right out, so there is never any trouble from that cause.

Mr. THOMAS HENRY SMITH. The glass faces the north, also.

Mr. H. G. MCKERROW. Yes, of course the glass faces the north, also.

Mr. C. J. H. WOODBURY. Mr. President, I had one more question to ask, and that is, in one-story buildings the question of the value of land is with us quite an important feature, and I wish to inquire if, under the English conditions of manufacturing of machinery, that also is a live issue, either value in title or by lease?

Mr. H. G. MCKERROW. It certainly would be if the machine shop was built within the city limits, and I think it is only fair to say that this idea of a single-story building can only be

carried out in a country district, where the question of taxation and land value does not enter so much into the consideration. This particular plant is located between Manchester and Rochdale and is not really within any township limits, and that is why they were enabled to carry the idea out so completely.

The PRESIDENT. Are there any further questions to be asked of Mr. MCKERROW?

Mr. WILLIAM F. SHERMAN. One point, I think is worth speaking of in this connection. The lighting through roofs of the English machine shops and factories is so much more extensive than here that it is very noticeable, and when we notice such large and expensive buildings as our South Terminal Station with the glass of the annex around it cracking within two years so extensively, there must be some difference in the methods of using glass as we apply it here and in many of the roofs to which it is applied over there. We see it in their railway stations, in their train sheds and in their cotton and woolen mills and print works very extensively. It seems to be a point that receives a great deal of attention, that any place that would under ordinary construction be deprived of a reasonable amount of light, they make the lightest part of the whole plant. In asking questions as to their use of the glass it is frequently said there that we have not learned yet how to use those large plates of glass; that we put them into our sash expecting them to stand as smaller lights of glass do in our ordinary windows, and we do not allow enough for the changes of temperature. Whether our changes of temperature are more extreme than theirs, or whether it is all contained in that idea of allowing more for the expansion of glass, is a point I would like to have brought out.

Mr. H. G. MCKERROW. The question of the difference in the temperature, of course, is a very considerable one; that is to say, the extremes of temperature in this country are very much greater than they are in England. With regard to any

other arrangements to prevent the glass breaking, I am not familiar with any such myself, except that I do know that all engineers and architects over there have a regular scale or rule by which they figure out the prospective contraction and expansion of a plate of glass of a given size. I presume they do so here also, but whether they have carried it out to any greater perfection there than here I do not know. But apart from that, it is simply the question of a more even mean temperature; the extremes are less.

Mr. THOMAS HENRY SMITH. I would say, Mr. President, that weaving in England is all done in sheds. They used to have the looms in the bottom room of the mill occasionally, but that has been abandoned and the sheds are made with the saw-tooth roof which Mr. MCKERROW has shown us, and they are made 20 feet span, that is, the pillars are 20 feet apart each way, and the gutter carries the roof. The cast iron U-shaped gutter beam carries the roof and also receives the water from the drainage. The water from the drainage runs down the inside of the pillars into the ground that way. The panes of glass are not very large. There is some breakage; the shafting shakes the roof to some extent and breaks some of the glass, but not to any great extent. The glass is eight or ten inches wide and runs the entire height of the saw-tooth roof, which is six or eight feet high. The lights always face the north, so there is very little sun on them, and as Mr. MCKERROW says, the extremes of temperature are not as great as in this country, so there is no trouble with them.

The PRESIDENT. Anything further? If not, we will proceed to the next paper, which is on Accounting for Cotton Mills, by Mr. A. O. KITTREDGE of New York. This paper on Accounting for Cotton Mills is unprecedented in this Association, and for good reason; those who can treat the subject in a broad manner, setting forth the latest applications of the art of accounting on large affairs, are necessarily rare. JOHN BRIGHT said that the true orator was the one who could return in a gentle

rain of speech the inspiration which he had received as mist from the audience, and the author on this occasion desires to present the subject along the lines of adapting his remarks to the experiences of the audience, and with that purpose in view, hopes that those present will exercise the fullest liberty in asking questions, desiring that this treatment of the subject shall take the form of a symposium, rather than a formal paper. [Applause.]

Mr. A. O. KITTREDGE. Mr. President and gentlemen, the object that I have in view has been so completely expressed by your President that a few preliminary remarks which I had intended to make before my reading are quite unnecessary. I have requested that copies of this paper be distributed in the seats before the reading for the purpose of bringing to your attention the chart which occupies the middle pages. The little that I shall read to you simply leads up to a consideration of the chart, and I shall esteem it a personal favor if questions are asked after the reading has been finished that will enable me to elucidate those points which you are most anxious to inquire into. I will say further by way of preliminary, that what I present is not theory, but is practice; it is something the utility of which has been demonstrated in various lines of industry including several large cotton institutions. It is something that in practice is fully approved by those practical men who have inquired into it.

ACCOUNTING FOR COTTON MILLS.

A. O. KITTREDGE, C. P. A.,

Professor of Theory of Accounts, School of Commerce, Accounts and Finance, New York University, and President of the Account, Audit and Assurance Company, Limited, 25 Pine St., New York, N. Y.

The matters to which I shall venture to direct your attention at this time are in some respects radical. They are radical not only from the standpoint of the cotton spinner, but also from the point of view of the ordinary business man; and yet, in the light of the success of the application of the measures described, I am inclined to believe that they are valuable to all concerned.

The keynote of what is to follow is that "Accounting is the vital element of business." As business men and manufacturers, we can get along without various business adjuncts, temporarily at least, but we cannot exist without accounting. Imagine the condition of your mills some bright day, if everyone charged with bookkeeping or clerical responsibilities should put on his coat and walk out on strike. You can stand in idleness when spinners and weavers are on strike, but even in times when mills are shut down the accountant's work continues.

The next point to which your attention is called is that manufacturing, from the accounting point of view, is only a "conversion of assets." From this standpoint cost accounts and cost records become matters of extreme simplicity. The "costing" of a given operation becomes then only a transcript or a record

of the actual facts. The element of estimate is entirely eliminated.

Let us illustrate this:

At the outset we have cash. A part of this is exchanged for materials, another part for labor, and still another for the general cost of operating the mill. The result is product, which has cost us exactly what we have expended for it, neither more nor less. We have simply changed our assets from cash into manufactured goods.

The buying of materials, including cotton, is likewise a mere conversion of assets. We exchange our cash for cotton. Whatever our cotton costs, so should it stand in our balance sheet until it is consumed or resold. The market price may go up or it may go down, but the fact still remains that our cotton cost just so much and is therefore the representation of just so much of our real assets.

Right here let me pause to mention a case which came to my attention only a short time ago in Boston. A certain cotton mill man said to another in the same industry, "I was very lucky this year; I had a lot of cotton on hand that cost me only 8½ cents, but it went into the inventory at 10½." This was when high prices were prevailing. Inventorying at that time in the way he did it made his year a good year. Inventorying today, with cotton down, as I understand it to be, would have made a vast difference in his showing. The argument that I am trying to get before you, in the sense of valuation of assets, is that the cotton bought should stand at what it costs until it is used or sold.

The object of all accounting, I take it, is to present a final and correct balance sheet. The term "balance sheet" is used in this connection as the ultimate result. Leading up to it and auxiliary to it is the "profit and loss statement." The latter shows where and when we have made or lost. On the other hand, the balance sheet shows our actual financial condition, — our degree of solvency or insolvency, as the case may be.

No man can make money trading with himself. As an axiom, it may be asserted that no money is made in either merchan-

dising or manufacturing until the goods are sold, — that is, until they have passed from the hands of the merchant or manufacturer into the hands of a second party. When, therefore, we inventory our materials at any other figure than their cost, or when we inventory our manufactured goods at any other figure than actual cost, we are likely to put upon our books an apparent profit or apparent loss, which, as a fact, does not exist. We should remember that the value to us of these assets is simply what they represent in cost, or as explained, in conversion of assets.

These statements are made with the full knowledge that in various respects they do not agree with current practice in the cotton industries, nor yet in various other branches, but they are the necessary preliminaries to an adequate classification of accounts and to a correct statement of business operations.

There are one or two other features to which brief attention should be given before considering the analysis and classification of the accounts of a typical cotton mill. One of these is the distinction that is to be made between fixed and floating assets.

So far as my observation goes, there are less lapses from the correct principle in this regard among cotton mill men than in any other branch of industry which I have encountered. However, even though this is the case, there will be no harm in referring to it.

A sharp distinction is to be maintained always between fixed assets like mill property, mill equipment, tenement property, etc., and floating assets like materials, including cotton and manufactured product. As a fact, it makes no difference to you as manufacturers whether a given mill (meaning now the land on which it is situated, the buildings and the mechanical equipment, including power plant, etc.,) stands on the books at $100,000 or $1,000,000, so far as the earning results of the mill are concerned. A mill makes or loses money according to the way in which it is operated and as influenced by market prices of materials and labor and finished product. It does not make or lose money in the direct sense of the term by reason of the figure at which it is carried on the books as a fixed asset.

I trust I am understood in this regard, and to ensure this end I have been careful in giving particulars.

It does make a material difference in capitalization whether the plant is carried at a low or very high figure, and it does make an important difference in the matter of dividend paying whether the mill property is underestimated or overestimated in value. All this is, of course, conceded. The point I want to make, however, is that in the running of the mill, money is made or lost, as the result of the operations alone. This leads me to the conclusion that in our classification of accounts we must very carefully distinguish between that which is fixed and that which is floating, between that which has an established value, like the mill property referred to, and that which is changing or fluctuating all the time as the result of the operations in progress.

The next point to which I desire to direct your attention before considering the matter of classification and analysis is one entirely practical in character and which by its nature comes close home to every cotton mill man. What does the manufacturer or business man want to know from his accounts? When does he want to know it, and how does he want to know it?

My observations in the business world lead me to believe that the average set of books, whether in the cotton mill business or in any other, contains a very large array of miscellaneous information, ill assorted and very often slovenly presented, in which the managing man has little or no interest. On the other hand, there is omitted from the average set of books a great deal in which he is vitally concerned.

Our classification, to be of any value, must sort up the facts of the business in such a way as to give the managing man just what he wants to know, in the way he wants to know it, and at the time he wants to know it.

Mention has already been made of the profit and loss statement as preceding and being auxiliary to the balance sheet. The balance sheet has been defined as a statement of the solvency of the concern. As books are ordinarily conducted, the profit and

loss statement is made out at long intervals, say of three months or six months and in many cases only once a year. When the profit and loss statement has been completed, the balance sheet as of that date is then constructed.

With the balance sheet thus made out, we feel that we have a new lease of life. We have been made acquainted with the results of our recent operations, and upon that information we are in a position to make plans for the future. If all this occurs only when a balance sheet is available for examination, and if we are at a corresponding disadvantage during those periods in which we have no balance sheet, then, inferentially at least, it would be extremely desirable to have a balance sheet before us at all times. In other words what the business man wants is a going balance sheet.

As before stated, however, a balance sheet complete in all details is possible only when a profit and loss statement has been made out. The fact that logically follows is that the business man would be best served in this regard by having a perpetual or going profit and loss statement.

From every point of view it would seem that the cotton mill manager's plans would be most intelligently formed and his operations best conducted if he had the advantage of the use of a perpetual profit and loss statement and a perpetual balance sheet. Or, to state it otherwise, with a profit and loss statement to date and a balance sheet to date constantly before him, he is in the very best position to decide the policy and give directions to his subordinates. Such a result is by no means impossible. In fact such a result is easily accomplished, and that too, as experience has proven, at a cost in many cases even less than that which attends the usual bookkeeping plans, and in no instance has it exceeded the cost of common clerical administration.

The ordinary manufacturer, including the cotton mill man, transacts a dual business. He both makes goods and sells them. The ordinary merchant, on the other hand, transacts a business of a single function. He merely sells that which he has bought.

The two functions of making and selling in the cotton mill business, as well as in any other manufacturing line, must be kept apart from each other. They are unlike in details and unlike in results. There are other good reasons for this separation. It makes no difference how economically our goods are made, we may lose money on them simply by extravagant sales methods. On the other hand, it makes no difference how excellent our machinery is for disposing of goods, nor how economically it is administered, we still may fail to make a profit because our goods cost too much to make. The cotton mill operator, therefore, wants to know first, what his goods cost, independent of any commercial or distributing expenses, and second he wants to know what his commercial expenses are, independent of any costs of production whatsoever.

Right here it seems to me I hear some one say that commercial or distributing expenses in cotton mill operations are reduced to such a small quanity that, practically speaking, it may be declared that they do not exist. Cotton mill men are in the habit of consigning their goods to commission merchants and in various ways avoiding ordinary commercial expenses. Admitting that all this is true, still there are exceptions to the rule, for some of you have considerable commercial expenses, and all of you have some commercial expenses, even though they are only the charges of your commission merchant.

The point to be made is that whether the commercial expenses are large or small, still there should be a distinction between them and the cost of making the goods.

Let us consider for a moment the elements that enter into the cost of goods. There are first the materials. Next there is the labor, and finally there are the costs of operating the mill, including such items as power, light and heat, superintendence, foremanship, clerical labor, insurance, taxes, repairs and depreciation, and various incidentals.

I have already directed your attention to the fact that manufacturing is only a conversion of assets. We have exchanged cash for materials and labor, and have paid factory costs, with

the result that we now have so much yarn or so much cloth, as the case may be. Whatever we have represents the money expended for it, and nothing more nor less. The factory by its operation can neither make money nor lose money, for profit can only be made when the goods are sold, or when the property passes from our hands into the hands of another in exchange for cash or some other substantial value. Factory accounting, therefore, as has already been asserted, is only a record of facts, a proper placing of costs, a correct statement of just what has been done.

These facts have an important bearing upon the classification of accounts and the analysis which should be the basis of any accounting scheme. Since manufacturing is only a conversion of assets, then all factory expenses in the chart of our accounts will fall into the asset division. On the other hand, all commercial expenses, being those which must be paid to dispose of our goods, fall into the profit and loss statement.

Returning to the question suggested above, as to what the business man wants to know, it may be asserted that the manager of a cotton mill would like to have constantly before him, among other facts the following:

A. The amount of cotton and other materials on hand stated at cost.
B. The amount of goods in process of manufacture stated at cost.
C. The amount of manufactured product on hand, likewise stated at cost.

These items collectively constitute a running or perpetual inventory. There is a distinction between a running inventory and an inventory that is taken from time to time as a separate and distinct proposition. The first is like a cash book showing all the fluctuations in the cash by the entries made and the amount on hand by the difference or balance between the two sides. The occasional inventory, on the other hand, is like the first entries made in opening a new set of books. There is nothing behind them except observation and inquiry as to general facts. They

are unsupported by the going record of a previous period, the examination of which would reveal errors, if errors existed.

The manager of a cotton mill would likewise be well served by a running or perpetual profit and loss statement. This would show:

A. The commercial expenses or costs of marketing the product that is being disposed of.
B. Losses that are being encountered in the way of bad debts, and likewise in the way of depreciation of goods or product on hand.
C. The gross profit on the goods sold.
D. The net profit on the goods sold.

All this becomes easy with proper classification and proper adjustment of the bookkeeping machinery for the accomplishment of these results.

With a going inventory and a going profit and loss statement, a running or perpetual balance sheet follows in natural sequence. At this stage it becomes a matter of course, something that requires nothing in the way of preparation and something which causes no extra expense. The going balance sheet shows at all times the exact condition of the business, presenting the accounts of assets and liabilities in correct arrangement.

Where a single proprietor or corporation is conducting several mills, all these details are shown for each mill, independent of the others. Each mill divides into several departments, and the statement of each is rendered independent of the others. To particularize this by way of illustration, it may be asserted that the scheme in mind and which is correctly represented by the chart accompanying this paper gives the following:

A. The cost of roving of different kinds, sizes and colors, running side by side.
B. The cost of yarns, warp, filling, hosiery, etc., of different character and different colors, as well as of different numbers, running side by side.
C. The cost of cloths of different weaves, kinds, weights, etc., running side by side.

And now a word or two of explanation concerning the chart which has been prepared by way of illustrating these remarks.

You will see the chart has at the top "A typical cotton mill." Under it is a brace which takes in the two divisions—"Balance sheet," and "Profit and loss statement." The fundamental proposition is that no business can have any accounts which will not properly classify in one or the other of these two grand divisions, namely, the balance sheet and the profit and loss statement.

All the accounts of any cotton mill, or of any business for that matter, will subdivide into two general classes indicated in the chart by the principal divisions, — namely, the balance sheet and the profit and loss statement.

In our balance sheet we can have nothing but assets and liabilities, and considering our capital stock and undivided profits as liabilities of the business, the assets and liabilities exactly balance.

You will notice that the balance sheet, appearing at the left on the inset, consists of two braces. Opposite the upper one of these is "assets," and opposite the lower of the two is "liabilities." In the profit and loss statement you will see a similar division into "expenses" and "revenues."

We can only have in the profit and loss statement expenses and revenues. Our expenses, as before explained, are restricted to the costs of distribution of goods, and our revenues are what is realized over cost in the way of sales of materials and manufactured product, and likewise in the way of revenue from whatever there may be carried on in connection with the mill as side industries or subordinate undertakings.

Referring more specifically to our revenue accounts, it may be stated that if we debit each of our sales accounts with the cost of the goods disposed of and credit the corresponding sales accounts with what we get for the goods, we shall have as the result the gross profit on the transactions. Each revenue account is to be closed at very short intervals, by carrying its balance into loss and gain. In turn, at corresponding intervals

loss and gain is debited with the expenses for the period during which these sales have been made. Gross profits diminished by the expenses of distribution produce net profits, and that is exactly what our four-week loss and gain account shows.

To debit our sales accounts properly,—that it, to charge them with the cost of the materials or goods sold,—we must necessarily credit the asset account from which they were taken with the same amount. This leaves behind in the asset account the balance on hand, thus completing the circle.

The absurdity of the old merchandise account, which permeates much of the bookkeeping of the period — namely, the fact that in a single account two sets of values are used indiscriminately, the cost of the goods on one side of the account and the selling prices of the goods on the other — is avoided by the employment of two accounts, one called "finished product" or "manufactured goods" to record the stock on hand, in which cost prices alone are employed, and the second a sales account, to show by its balance the gross profit on the goods disposed of.

The chart is intended merely to typify the accounts of an average cotton mill. It is, in abbreviated form, very much like that which has been employed for several cotton mill enterprises. Under the head of "assets" we have well recognized accounts which need very little explanation. There are first, the cash items, following which are "notes receivable," "accounts receivable," and then "cotton and other materials."

Cotton, or the material account, either in a single proposition or in several, as the case may be, would be debited with the cost of the cotton or other materials, as the case may be, purchased, and credited as the cotton or other materials are consumed. Right there is in some respects a new principle, or a new application of an old principle, so far as the manufacturing account is concerned; namely, instead of charging into the factory all the goods or materials purchased, to charge into the orders executed only that which is consumed.

The next division we have is "accruing manufacturing costs," including such items as "heat, light and power," "superin-

tendence and foremanship," "clerical labor," "repairs of plant," "depreciation of plant," "taxes," "insurance," "accidents," "incidentals." These are the costs that must be pro-rated over the product. There are certain charges against a given lot of goods that may be made specific; the pounds of cotton consumed and the amount of the pay roll are easily ascertained. There are certain going expenses, such as the cost of operating the plant, included under the heads just named, which upon one plan or another—and there are several methods of doing it—must be pro-rated over the product. These for convenience in this chart are grouped under the head of "accruing manufacturing costs."

We next have "manufacturing," sub-divided for the purpose of getting a bird's-eye view of the whole enterprise under such heads as "Mill No. 1," "Mill No. 2," "dye works," "bleachery," "machine shop," "carpenter shop," and "paint shop." In Mill No. 1 are such divisions as "roving," "yarn" and "cloth," being ordinary typical sub-divisions of the product of the cotton mill. There may be others in some enterprises, some reducing to two, some increasing to more than three.

The elements of cost in roving would be "materials," "labor," and "manufacturing costs," the same analysis that we have already given attention to. The cost elements of yarn are put down the same as the cost elements of roving; and yet roving is the material out of which yarn is made. The cost of cloth is put down the same as roving; and yet the raw material entering into cloth upon the basis of classification that we are following is the finished yarn from the preceding process.

Mill No. 2 is classified the same as Mill No. 1, simply for the purpose of indicating how the accounts of two or three mills would be kept separate, thereby letting "each tub stand upon its own bottom" and enabling the manager to determine in which money is being made or lost, or which one is making the most or the least. Likewise the dye works, the bleachery and the machine shop, all stand separate and distinct, the work carried on in each being governed by the orders. The charges to each order consist of materials, labor and manufacturing costs.

If we charge into our manufacturing accounts all that they cost, being materials, labor and accruing manufacturing costs, and if we credit our manufacturing account from time to time with the actual cost of the goods produced according to the cost record, then the balance remaining in our manufacturing account will be the cost value of the goods in process. I call attention to this feature simply because it is essential to the proposition upon which we are working, namely, that we shall have a going balance sheet of the business. A going balance sheet requires a statement of all the assets all the time, and the work in process is a very important asset.

The next item in the asset division is "finished product," which would be the account debited with the goods produced taken at cost, and corresponding with the credit that is passed to the manufacturing account.

Following this come the fixed assets, to which attention has already been given—including "manufacturing plant," and "tenement property." "Manufacturing plant" is put down under various heads, signifying that it may be classified, or subdivided according to the requirements of the case.

Finally we have "items in suspense," meaning those items which are paid in advance of their consumption. We pay insurance in advance. It is not an expense of the month or the day on which the premiums are paid, but rather, an expense to be pro-rated over the period for which the premiums are paid.

It is scarcely necessary to go through a similar analysis of the items that are in the liability division. I will only call your attention in passing to what is termed "reserves." We have various accruing expenses, both in the commercial and manufacturing departments, which cannot be paid every day or every month, but for which provision must be made each day and each month for the purpose of charging into that period that which rightly belongs into it, thus accumulating a fund out of which to pay the expense whenever the bill is rendered. An illustration would be taxes. As assessed and collected in various parts of the country they are paid at the end of the

period. I use this illustration, knowing that the laws of the various states vary somewhat in this regard. In many cases, however, they are paid at the end of the period. Taxes, therefore, are a part of our expenses today, although we may not be able to pay the bill for some months to come. We must charge taxes into the expenses as we go along, thereby accumulating a reserve. The reserve account gets the credit as we go along and in turn is debited whenever the time for paying the taxes comes round.

Now, passing to the profit and loss statement, the expenses are divided into three classes, administrative, commercial and miscellaneous. The administrative expenses are self-explanatory, referring mostly to those things which are in effect short circuits on profits. The commercial expenses are those which record the costs of selling or otherwise disposing of product and by name are those which seem desirable from a statistical point of view. The miscellaneous expenses are a group which relate to the auxiliary undertakings of the company, such as taxes on tenement property, insurance on tenement property, repairs and depreciation on tenement property, etc.

Finally comes the group of revenue accounts, which you will notice are all virtually sales accounts. The principle of each sales account is to debit it with the cost of goods disposed of and to credit it with the amount obtained for the same. The finished product account, therefore, would be credited from time to time with the cost of the goods sold. The balance remaining in the product account would be the asset value or cost of the goods remaining on hand and the balance in the sales account would be gross profit. Gross profits diminished by expenses give net profits.

Now in this very brief and, I must acknowledge, inadequate presentation of a principle and the application of the principle, there has been left out all remarks whatsover concerning the bookkeeping details of the scheme. I have attempted to get before you merely a theory of accounting, omitting all consideration of such questions as to whether we are to have a cash

book or a journal or a sales book, or a book of any kind whatsoever. In the practical working out of this plan there are various mechanical expedients, various forms of rulings, and various blanks, that may be employed in the office, in a way to render the general question very much simpler than it would appear on the surface. If I had the time and perhaps also the use of lantern slides and a screen, I might bring to your attention a number of the devices referred to. In that case I would have a very much easier task before me to make you comprehend how this plan can be carried out than as at present, when it is presented in the abstract. Suffice it then, for the moment, to say that all these things have been worked out and that the results here set forth have been satisfactorily accomplished for cotton mill men, and for textile manufacturers generally, and for various other industries throughout the entire country. What we do is to bring engineering practice into the office, the same as engineering practice has been introduced in other directions.

If you want to build a cotton mill today you secure an architect for the building, and a mechanical engineer for the equipment. If it is a question of a dam across a river, or if it is a question of an electric plant, you consult an engineer that is an expert in the matter suggested. So accounting, at the hands of those who approach it from an engineering point of view, becomes a matter of investigation and careful selection of ways and means. It is very different indeed from mere bookkeeping. As my experience shows, cotton mill men, as well as others, are usually long on bookkeeping, but very short on accounting. I have attempted to hold my remarks this afternoon entirely to accounting. [Applause.]

The PRESIDENT. Gentlemen, Mr. KITTREDGE will be very happy for anyone to ask any question that may occur to him.

Mr. ARTHUR H. LOWE. Mr. President, I would like to ask Mr. KITTREDGE one or two questions in reference to his paper. I am most heartily in sympathy with the idea of the plan that he has submitted, which is certainly very interesting, but for the sake of argument and for the sake of raising the question, I am going to refer to his statement that "the element of estimate is entirely eliminated". Now it seems to me that to the practical manufacturers, the element of estimate is very important. It exists, and it is impossible for us to get along without that element, because we want to know what goods *will* cost as well as what goods *have* cost. For instance, we buy a cargo of coal; we have not the slightest knowledge of how much heat or steam that coal will produce. We do not know its quality and we can only know it after it has been consumed. We buy a lot of cotton and we have no idea what the waste of that cotton will be; we cannot know what it will be until at some later time we have taken an actual inventory of what it has produced. There are so many things entering into the actual manufacture and production of goods that it seems to me almost impossible for us to eliminate the element of estimate. We do not know what the temperature is going to be, consequently we do not know how much coal is going to be required to heat our buildings during a certain time, and this applies to everything that we handle. Our coal, our cotton, our dye stuffs and all of the materials that enter into our goods are more or less subject to results that it is impossible for us to control. Now, having divided our accounts as suggested by this balance sheet, we proceed with the manufacture, and it seems to me that it is absolutely necessary for us to do exactly what Mr. KITTREDGE would eliminate, and that is to take an occasional inventory. On page 161, he says: "The occasional inventory, on the other hand, is like the first entries made in opening a new set of books."

I do not see how we can tell the actual results for a month,

three months, six months or a year without taking this actual inventory. We can have a report sent to the office every day of the actual product, for instance, of a roving machine; but it seems to me that it costs about as much to make it up in that way and to make that report as it would to produce that roving. That is simply an illustration of what might occur in the boiler room, or in the consumption of cotton, or in the dye house or elsewhere. We keep the daily reports and confirm their correctness by the inventory. I simply suggest this as one of the difficulties that I see with the proposition that Mr. KITTREDGE has laid down as an exact science.

Mr. A. O. KITTREDGE. I beg to remind the gentleman, to start with, that there is nothing in all that I have submitted this afternoon that mentions a report. As an accountant, I am strongly opposed to reports of going operations. They are in a majority of cases merely excuses for something that is wrong, or something to cover up that which is wrong. Whenever I go into an establishment and find an abundance of reports as a part of the current work I am always sure without going any further that the accounting is radically deficient. Good accounting requires very few reports; because it presents the thing itself without the report. By the same argument, good accounting requires no inventory; it shows the result without the inventory.

I am not opposed to inventories in the sense of taking an account of stock to prove a book account. I am opposed to inventories in the sense of taking an account of stock to find out how much we have on hand. We should know what we have on hand before we start to make the inventory. The only purpose of the inventory should be to prove the correctness of our account.

Now for an illustration. We keep a cash book. On one side is all that we receive; on the other side are the items that we pay out. We count the cash at night — we inventory the cash — why? To ascertain the amount to write into the cash book for the balancing? Not at all. The difference between the

debit side and the credit side, we will say, calls for $100. We count the cash to prove the correctness of those figures. Have we $100 on hand? Yes. The account is deemed correct and the balance is entered and the footing lines are drawn. Have we only $99 on hand? There is something wrong, and we at once agree to spend an evening to hunt up that missing dollar.

The principle of the cash book — showing always the balance that should be on hand to be verified by an actual count of the cash, is extended to our material accounts and to supplies of any and all kinds. It is this which we are advocating, in place of the old single-entry plan, which had no account with items of this kind, but always compelled us to take an inventory as a beginning. It never had a finish, but always was at the beginning.

Mr. LOWE has referred to the word "estimate". Perhaps I would be better understood in what I have presented to you if I had said that in cost records all "guess work was eliminated," rather than that estimates were abolished, for there are certain estimates in advance of ascertained results which you must always make; but estimates as a means of ascertaining results, should never obtain. The illustration which Mr. LOWE gave was coal. He says, you buy coal and you do not know what its value in thermal units is or what amount of steam it will generate, or what power it will give you in your mill, etc., until you have actually consumed it. Admit that this is true. Still you know how much that coal has cost. You have bought, say, 100 tons for such and such a figure, and you have consumed it in one month. Therefore, without an estimate, without stopping to make an estimate, the actual fact stares you in the face that the cost of the goods produced in that month must include 100 tons of coal at the figure you paid for it. If you had bought some other coal of much better quality, you might have got through with 75 tons, but having bought as you did and consumed as you did, it was so many dollars cost. If you had had the good fortune to buy when coal was very low the cost would have been less; but as a fact it cost you what it cost.

The same remark is to be made with reference to cotton. You buy a lot of cotton; you do not know the amount of waste there will be; but so much cotton at so much money went into your mill in a given period and such a result has come out. That result, whatever it may be, roving or yarn or cloth, has cost you so much in cotton, represented now by dollars. It is nothing more and nothing less. If you had bought other cotton, either at the same figure or some other figure, that differed in quality, you would have had more or less roving or yarn or cloth, as the case may be, but in the result there would be no estimate. So far as your costs are concerned, the record is simply a transcript of facts. It is in that sense that I have discussed this entire question.

Estimates, in the sense of guess-work as to cost, are eliminated, and by the plan explained you will always have before you that which represents the facts — so much coal, so much cotton, so much labor expressed in money cost in one pan of the scale, so much product in the other exactly balancing the first. The product cost you in dollars and cents just what those other items cost you in dollars and cents.

Mr. ARTHUR H. LOWE. Mr. President, I think Mr. KITTREDGE perhaps misunderstood me, or at least, my idea. It was rather dealing with the prospective cost than with a past cost. It seems to me any manufacturer ought to know what stuff has cost him in the past, what his coal has done and what his cotton has done. But a man selling goods, for instance, in New York, is faced with the question, "What will you make these goods for"? He must take into account an estimate — you may call it guess if you please, but he certainly must estimate from some figure what those goods are going to cost him, — what goods will cost, rather than what goods have cost. It seems to me every manufacturer must keep an account of his coal pile and of his cotton. He knows whether he has used five bales or ten during a week, and of course that comes into the office, perhaps not as a report, as Mr. KITTREDGE objects

to that, but as an accounting. But it seems to me that the manufacturer is certainly obliged to make, in consideration of all these uncertainties, a great many estimates in his business. It is an easy matter to keep account of the facts as they develop, but to have a knowledge of what goods are actually costing and what certain fabrics will cost is not so easy a proposition as it occurs to my mind, even having, of course, the accounting as the materials are consumed.

Mr. A. O. KITTREDGE. The division of our subject where the word "estimate" occurs, and in fact, the only view that has been taken of cost of goods in all that has been presented this afternoon, is the record of actual cost in the sense of manufacture. I admit frankly without reservation that there are certain estimates necessary in the sales department as to what things will cost in view of markets, and in view of various conditions that are altogether problematical at the time the sale is made. But these necessary estimates in the sales departments should always be based upon the actual records in the manufacturing department. My remarks this afternoon have been restricted entirely to the record of costs in the mill; and I have attempted to show that by proper accounting there is no estimate there. Instead there is simply a sorting up of the items of actual cost in their proper relationship thereby producing a result. What I have offered is opposed to certain guess-work or estimate-basis plans of arriving at cost. It is also opposed to the plan of following costs a little ways and then guessing or estimating the balance. The only correct plan is to have all the costs all the time arranged in correct sequence under the manager's eye. In other words a "going" profit and loss statement, and a "going" balance sheet.

The PRESIDENT. The next subject is "Humidifiers in Cotton Mills". This is an important subject; a good deal has been done with reference to it, much is being done, a great deal remains to be done. Mr. C. E. W. DOW of Atlanta, Ga., will present the matter to the Association. [Applause.]

HUMIDIFIERS IN COTTON MILLS.

C. E. W. Dow, Atlanta, Ga.

The subject of humidification has become of great importance during the last few years. The tendency to make finer goods and the decreased margin of profit, combine towards this end. In order to displace imported goods it is necessary to study the methods and conditions under which the foreign goods are made. We have been told that the climatic conditions, more especially the natural humidity, have determined the location of the finer factories. That this was true, there is no doubt. The general introduction of means for producing artificial humidity has done away with the necessity for finding a natural humid location, enabling the manufacturer to locate wherever other conditions are favorable. The decreased margin of profit renders it necessary to take into account every means for producing goods at the lowest cost, without sacrificing quality. Humidifiers are a means to that end. Originally introduced to create a necessary condition for making fine work, their merits have become recognized, and their use extended to the coarsest goods made.

Some years ago the topical question of "How to run mills in dry and dog-day weather" was brought up frequently before this Association. This was before the advent of a satisfactory apparatus for artificial humidification. The discussions were largely in the way of stating difficulties, but without giving remedies. This subject held over from year to year, but latterly

has not been brought up, the general use of humidifiers having practically solved the problem.

I will not attempt to treat this subject on a scientific basis, as other and abler men have already done so. In fact, this subject has been referred to before this Association so often and ably, that it is difficult to present much that is new. I have been sorely tempted to use scissors rather than a pen, in preparing this paper, with my file of the Transactions as material. I will therefore confine myself to relating some personal experiences and making some observations.

The cotton as you receive it often contains a large percentage of water. There are stringent laws against putting water directly into the bales. There is, however, another way of sending water to market. Those who have travelled in the Cotton States have no doubt noticed how the producers store their cotton. It is frequently exposed to the weather, carefully covered in bright sunny days, but promptly uncovered if rain comes on. Such cotton has altogether too much of a good thing.

Average cotton contains considerable moisture when opened. This should be retained, in proper amount, in order to work with a minimum of waste. Moisture strengthens the fibre, causes it to cling together and to assume any desired position by rendering it elastic and pliable. Cotton opened in a dry mill rapidly gives up its moisture. Every operation facilitates this loss and by the time it is in the form of yarn, it has lost all that the air will take up and is as dry as the air in the mill. It has lost its softness, is harsh and stiff, has very little adhesion and becomes highly electrified by friction. The fibres become separated readily from the slivers and fly off, making waste and sweepings. During the continuance of a dry windy spell of weather, the laps in the carding room, the roving both stored and laid on the spinning frames, bristle with these electrified fibres. All the lint that gathers on the machines stands on end as if in protest against the conditions.

Yarn spun under these conditions is harsh and kinky, and nothing but steaming or prolonged aging will set the twist, to

allow it to be used as filling. Kinky filling is one of the most unmitigated nuisances that a weaver has to contend with.

It fell to my lot, at one time, to be a loom fixer in what might be termed a "lighting change" mill. We had about two and one-half times as many looms as we had working space for, the surplus being stored. They were of about all kinds adapted to our range of yarns. We would frequently begin when the mill shut down Saturday, taking out warps, removing one kind of looms, and replacing them with others and getting things in readiness to start Monday morning on another kind of goods.

Warps were made in anticipation of the change, but we would have to take filling hot from the frames. There were no humidifiers in the spinning rooms and the way the filling would kink is something bad to remember. We tried everything we could think of in the way of shuttle frictions, but when we succeeded in getting the kinks out, we had saw toothed selvedges to contend with.

We used the old style vapor pots, with live steam, to humidify the weave rooms. They were of some use, but introduced some bad features of their own. They would excessively humidify in spots, cause condensation on the looms nearest and on the ceiling and shafting, rusting all bright iron work and rotting the floor. Besides this they made the rooms uncomfortably hot and gave forth an odor that was far from pleasant.

If located far enough from the adjacent looms to avoid wetting them, they take up valuable floor space. A modern system would have made my recollection of this time much pleasanter. It would have done away with a great many of the troubles consequent on these changes.

I am of the opinion that humidifiers are valuable in every room of the mill, with the single exception of a room devoted exclusively to slashers. They will not be required at all times in the picker room, but, if the cotton is very dry they will give you an advantage. It is then possible to start with the cotton in the best possible condition and keep it so throughout the mill.

There will be no trouble from electricity in the carding room

and the waste and sweepings will be reduced. The fibre draws better, in consequence of being stronger, is more elastic and adhesive. In the spinning room the same advantages obtain. The fibres are more receptive of twist and when spun do not have such a tendency to kink. This allows filling to be used without steaming or aging, which is very important. In twisting, spooling and warping, a proper degree of humidity is of great advantage. The yarn being stronger and more elastic, there is less breakage of threads. The greatest loss of production in these departments is caused by breakage of threads, which is materially reduced by the use of humidifiers. Yarn is more receptive of size in the slasher, if moist, as the size penetrates the yarn.

The slasher is the source of trouble that nothing but humidification will overcome. We will assume that up to this point all operations have been conducted under the best conditions, and that the yarn is in the best possible shape to use. It is then run through the size box under tension, the tension being determined by the amount of yarn required to be put on the warp beam. It is, of course, desirable to get a large amount on the beam, in order to lessen the cost of web drawing. The result is that the yarn is stretched, sometimes all that it will bear.

It then runs upon the cylinder and is thoroughly dried under tension, cementing the fibres together with size. It is possible to make size that will not dry hard, but in most cases it does.

The warp then goes to the loom prepared to stand the chafing of the reed and harness, but in the worst possible condition to withstand the impact of the lay.

The best way to meet this condition is to humidify thoroughly the weaving room. It requires a high degree of humidity to soften the warp in the short time that it is exposed to the air, as there is little exposed at a time. This is the reason why weave rooms require more moisture than other departments.

Of course, I have assumed extreme cases, but the principle involved remains the same under the best conditions.

There is another point in the economy of a weaving room that I do not remember of having heard mentioned, but have

experienced. Our climate is very variable, especially at certain seasons. First we may have a dry windy spell, when everything about the room becomes thoroughly dried out. The loom fixer has to adjust all of his looms to meet this condition. He reduces the power, tightens the binders and replaces pickers and picker sticks that have been used up by the impact of the shuttle in boxing too hard. Then comes a rainy spell; shuttles bind and stick, causing the looms to knock off and the fixer is wanted everywhere at once, to reverse the operation.

By maintaining a fairly constant humidity in the mill this trouble and consequent expense is in a great measure done away with. It also lessens the expense for supplies. A fixer can care for a larger section in a properly humidified mill than in one not so equipped. There is another phase of the advantages of humidification. That is the improvement in the health of the operatives. This has been taken up in almost all of the papers that have been presented touching on humidification.

The proper degree of moisture for the best health conditions has been determined, and a great many statements made confirming the value of humidifiers from a sanitary point of view.

I have run across a case that is interesting, as verifying these statements. It is as follows: A southern mill employs a physician by contract to look after the health of its people. Some two years ago the company put a system of humidifiers into a new mill when it was erected. After a year's run, the doctor, who kept a record of all cases coming under his care, reported to the management that the ratio of cases from the new mill was less than 50 per cent. of that in the mill not provided with humidifiers. This difference could only be attributed to the humidifiers, as the people lived in the same village and under the same conditions of life. The immediate result of this report was the equipment of three other factories under this management, and the statement that the installation would pay from a sanitary point of view alone.

About the proper degree of humidity to be maintained to secure the best conditions in the various departments, authori-

ties differ, although not widely. This question will probably never be settled, as conditions vary. There is one point, however, that I think all will agree upon, that is, that the humidity be as constant as is possible to maintain.

It is necessary, in order to realize all the advantages of artificial humidification, to keep a constant degree of moisture in the air. This should be attended to in weaving rooms early in the morning before the machinery starts, thus avoiding the usual difficulties of the starting hour, which are well known. In order to do this every room should be provided with at least one reliable hygrometer. Readings should be taken at regular intervals, and humidifiers turned on or off as the reading indicates. It would be well to have limits established as experience dictates, for each department, and some one to be responsible for the maintenance of the humidity between limits. It is easier to maintain a high degree of humidity than a low one by artificial means, as there is no good way of drying the air when too moist, while you can moisten to any desired degree, provided you have sufficient capacity in your humidifier system. In order to secure even conditions of moisture it is desirable to maintain the proper temperature as well. I believe that it will pay to employ a man whose sole duty is to maintain the temperature and humidity, unless the mill is too small to warrant the expense. Give this man the entire charge of the heating and moistening apparatus and require the limit conditions maintained in the various departments. Have the overseers take readings and record them, thus giving you a check on the man.

Hygrometers should be of standard wet and dry bulb thermometer pattern, and should be carefully looked after. The water used to moisten the bulb ought to be filtered, unless very clear. Otherwise the wick will become clogged with foreign matter and the bulb will not be properly moistened. The silk covering of the bulb should be frequently examined and renewed as often as required. I am told by a friend, who has had a long experience with hygrometers, that a wick of slack twisted worsted yarn is the best.

But if one hygrometer is used in a room, it should be located in the middle of the room where the air can circulate around it, and not in a corner or near a steam pipe. In large rooms where more than one is used, the same precautions should be observed. The hygrometer, if of good make and accurate, will tell the truth if cared for; if neglected it will lie shockingly. There are some so-called hygrometers that should be avoided. Most of them are affected more by temperature than by moisture. As the temperature rises and the relative humidity becomes less, they will indicate greater. This is very misleading.

The most fruitful cause of trouble with the humidifier system is want of cleanliness. A humidifier system is a faithful servant if cared for, but otherwise not. There is nothing about a mill that will not repay for care and attention and humidifiers are no exception. Lint and dirt will collect in a mill as elsewhere, and must be cleared away. It costs less to clean thorougly and frequently than to let conditions become unbearable before attending to them. One of the most serious objections to running nights is the certain lack of cleanliness and care, that is certain to ensue from the divided responsibility. The night hands shirk their duties, in the hope that the day hands will attend to them, and the day hands pass everything on to the night hands they can. Humidifiers are apt to fare badly in such cases. Nearly everything else in the mill has some one responible for its condition; why not the moistening system? I am interested and want to make a special plea for care for your humidifiers; they will require little, comparatively and will repay it many times.

In conclusion, I will say that those who are interested in this subject will do well to look up in their copies of the Transactions, papers presented before this Association by Messrs. HAWKESWORTH, WALMSLEY and WOODBURY, which cover the question in its application to weaving, spinning and in theory.

The PRESIDENT. Gentlemen, have you anything to say — any remarks or questions? If not, we will proceed to the next paper, the subject of which is Friction Clutches in Cotton Mills and the Philips Clutch, by Mr. THOMAS HENRY SMITH of Jamestown, New York. [Applause.]

FRICTION CLUTCHES IN COTTON MILLS AND THE PHILIPS CLUTCH.

THOMAS HENRY SMITH, Jamestown, N. Y.

By way of definition, permit me to say, that the clutches mentioned in this paper may be of two kinds. First a clutch coupling, which cuts off or connects two shafts with abutting ends, and second a clutch pulley which is placed on a continuous shaft, and which allows the pulley to be stopped and started without stopping the shaft.

1. With the exception of the paper read by Mr. R. H. HILL at our last meeting, it seems that the subject of friction clutches has never been presented to this Association.

2. This may be accounted for, from the fact stated by Mr. HILL, "that the friction clutch is a modern idea, and that more friction clutches were made in one day in 1900, than in the whole year 1875". One maker states he has made 30,000 clutches. I do not remember seeing a friction clutch in any English cotton mill up to the time I left England in 1880.

3. In former times the mills generally ran all the departments together, and the necessity for shutting down one room while the rest of the mill was running did not often occur. But of late years things have changed and no one can tell now what counts of yarn may be required from a mill. The mill may be laid out for fine counts, and be obliged to go onto coarser numbers, and this necessitates the running of the card room overtime, or a different weave may require more warp or more filling than usual, and one department may have to be operated at night.

4. Under these circumstances it is bad business policy, and a dangerous thing, to run the empty shafting and the belts on the loose pulleys in any of the rooms which are not working. Besides the waste of power, the risk of fire is so great, that the insurance companies require a special watch to be maintained in or over rooms, in which shafting is running and the machinery is not in operation.

5. Thus it frequently becomes needful to use a clutch, and stop the shafting entirely, and the old jaw clutch was first used for this purpose. But this clutch had too many disadvantages to be satisfactory, and it is only fit for slow running shafts such as waterwheels, etc. It cannot be thrown in, except when the shaft is moving very slowly, or standing still, and it cannot be disengaged with the load on while the shaft is running.

6. But a friction clutch can be started without stopping the driving shaft, and it can be disengaged instantly, with or without the load on, and this may be required at any time, in case of accident, or fire, or breakdown. I had a case in my own mill where a boy got entangled in a belt, and would undoubtedly have been carried over the shaft, if there had not been a clutch in the room, by which the shaft was stopped instantly.

7. To fulfil the requirements of a friction clutch, two friction surfaces, generally one of wood and one of iron, are placed in close proximity, so that they can be brought together with a strong pressure by the movement of the starting lever, and by steadily increasing this pressure they are made to take up the load gradually and carry it without slipping.

8. This is accomplished in various ways, sometimes two discs or blunt cones are forced together; or jaws, one above and one below, clamp the rim of a pulley; or a cone is forced into a hollow cone; or a steel ring is made to clamp a revolving hub; or a hub is expanded inside a shell; or a V shaped wooden shoe is pressed into a V shaped groove. Then there are or have been clutches operated by hydraulic pressure, and one clutch is operated by magnetic power.

9. In all mechanical clutches (except the Philips clutch) it

is essential, in order to obtain the required pressure, either that one half of the clutch must slide on the shaft, or else a sliding sleeve or collar must be used to actuate the levers and toggles, which push or pull the frictions into contact. The power required to do this is always antagonistic to the driving power, and, in large sized clutches, hand wheels have to be used with worms or gears to force the frictions together, until the toggles pass the centre, which passing always lessens the grip or contact.

10. The sliding of one half of the clutch on the shaft is objectionable, because this loosely fitting part wears the splines through which the load is driven. Then it is difficult to keep the ends of the shafts in alignment and this makes some clutches inoperative. The movement of the sliding sleeve or collar is undesirable, because the stationary ring which is recessed into the collar, and to which ring the forcing lever is attached, wears out, and is liable to heat, while the collar throws oil and is a nuisance generally.

11. The levers and toggles being of necessity outside the clutch, are unsightly, dirty and dangerous, and in no clutch that I know of, can they be tightened in case of slipping without stopping the driven shaft, and in one clutch that I had the driving shaft also had to be stopped, which meant shutting down the engine, and stopping the whole mill.

12. The Philips clutch which I have the honor to present to you has none of these defects and drawbacks. As I am not the inventor of this clutch, but have only helped to perfect it, you will pardon my saying that it has in it a touch of genius, which WEBSTER defines as "Superior power of invention or origination of any kind, or of forming nice combinations" and this is exactly what the inventor of the Philips clutch has done.

13. He has accomplished in clutches, what EADS did for the Mississippi river, when he used the current of the river to clean out the sand bars; or what BRUSH did when he made the electric current regulate itself in an arc lamp; or what JAMES WATTS did when he used the increase of speed in the engine to shut off the steam; or what WATTS' boy did when he tied the valve rope

to the beam, and made the engine open and shut its own valves, while he went off to play.

14. Instead of the resistance of the driving shaft having to be overcome, and the friction surfaces being forced together by an enormous outside pressure, the Philips clutch harnesses the driving power itself, and compels it to force the frictions into contact; and not only so but should the frictions slip, by an increase in the load, the power like a good genie harnessed and tamed, takes hold again automatically, and tightens the frictions.

15. The driving power of this clutch is limited only by the bursting strain of the shell. The explanation of this is as follows: The scroll plate (Fig. 3) in a 20-inch clutch makes 38 revolutions to one revolution of the gears. The gears *D* in Fig. 2 revolve 12 times to expand the friction blocks one-fourth of an inch. The rim of the starting plate travels 131.328 times faster than the friction blocks. This speed accumulation of power, accounts for the slight strain on the worm and gears, and relieves them from any possibility of breakage. (See par. No. 6 in circular.) Paragraph 6 in the circular referred to adds that when the friction is expanded and the load is all on, the gears can be moved with your fingers, showing the slight amount of friction put upon them.

16. So there seems to be no limit to the driving power of this clutch because the slipping starts the tightening and the tightening stops the slipping. It is something like the religious experience of the man who said that sinning stopped his praying, and praying stopped his sinning. Will the clutch ever slip? is answered by asking another question, If an irresistible force comes in contact with an immovable body what will be the result?

17. This principle is, so far as I know, entirely novel in the construction of clutches, and is a great step in advance of anything that has been done heretofore. But all the good things have not yet been told. This power, which has been harnessed by a nice combination, uses discretion in its work, and it has more sense than some people, for it knows when to stop. As

soon as the frictions are tight enough to carry the load without slipping, the winding ceases, and then if you do not want it to resume, the power can be unhitched so to speak, and the clutch *will* slip and so save the breakage of a machine that becomes jammed. This is a very valuable feature for punches and presses which are liable to jam.

18. Some other good points about this clutch are — It is all enclosed and has no levers, arms, joints or toggles, either outside or inside. It is self centering, and self adjusting, and takes up any wear in the frictions automatically. A difference in the alignment of the shafts will not prevent its operation. It is put together without a bolt and nut anywhere, so there is nothing to work loose. It contains only 13 pieces or parts, while one noted clutch contains 40. It can be made with very little machine work, because the sliding wedges and friction blocks can be cast chilled. It can be started and stopped by a boy. There is no end thrust on the shaft, nor any moving collars or sliding parts, the driving members being keyed fast on the two shafts. It takes no more room on the shaft than a common coupling, a 16-inch clutch occupying only 13 inches, while nine other makes of clutches take from $14\frac{7}{8}$ inches to 22 inches. It is equally adapted for clutch couplings or clutch pulleys, or for gas engines. It admits of a larger sized shaft than any other make, will drive the full power of the shafts and is driving over four times the load of an ordinary clutch.

19. The 16-inch clutch before referred to is on a $3\frac{1}{2}$-inch shaft, driving 125 horse-power with such perfect ease, that I would not hesitate to load it up to 200 horse-power if I could do so, while a 27-inch toggle joint clutch which I took off was so overtaxed that it slipped.

20. It is almost impossible to explain the working of this clutch from a description, and it does so much with so little that it is not easy to understand it from a description and drawings. The following explanation tells how the thing is done.

21. Please refer to the cuts as I read the description of its operation.

FIG. 1.

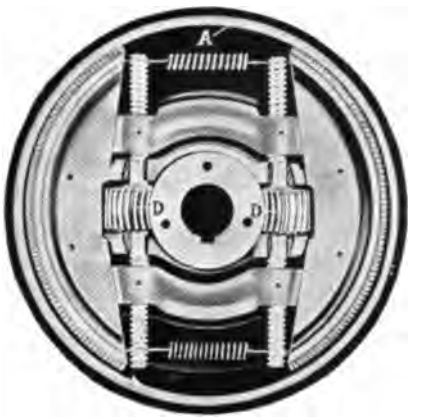


FIG. 2.

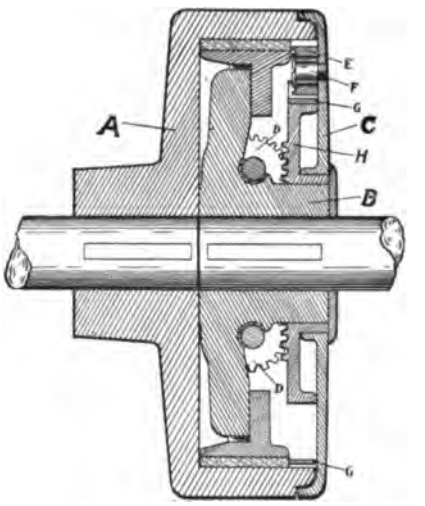


FIG. 5.

FIG. 3.

FIG. 4.

22. This clutch consists of three members or parts. First a hub and shell *A*, or overhanging flange described as the body of the clutch, keyed to a pulley or driving shaft. The second member is the driven part *B*, and consists of a central plate and hub, keyed to the driven shaft, which receives the scroll plate and carries the gears, right and left hand screws, wedges mounted on said screws, and friction blocks with converging ways on inner edges.

23. The third member consists of a two plates, viz.: a starting plate *C* and a scroll *H*, Fig. 5, which revolves independently on hub *B*, and meshes with worm gears *D*. Attached to starting plate *C* is the bowl *E*, loosely mounted on stud *F*. See Fig. 3.

24. *G* is starting spring, which is fastened to edge of scroll plate at *H*. Fig. 4.

25. The operation of the clutch is as follows: Starting plate *C*, Fig. 5, which is loose on the hub of scroll plate, being turned one-fourth of a turn in driving direction, either by hand or by power, carries forward, bowl *E*, Fig. 3, on the inclined spring *G* (Fig. 4) until it makes a contact with the inside rim of the shell or body of clutch as shown at *E*, Fig. 4. This contact presses the spring against the inside of shell sufficiently hard to drive the scroll (Fig. 3) at the same speed as the body of the clutch *A*.

26. Then the scroll shown in Fig. 3 turns the gears and right and left hand screws, forcing out the wedges against the inclined ways and pressing the friction blocks (see Fig. 2) against the inside of shell or body of clutch *A*. This operation continues as long as any relative motion exists between the two parts, *A* and *B*.

27. As soon as the speed of the driven part *B*, which carries the gears and frictions, equals that of the driving part *A*, the winding motion ceases. Should the frictions slip by an increase in the load, the relative motion of the two parts is resumed, and this starts up the winding motion and tightens the frictions. By relative motion is meant, a difference in speed between the driving and driven parts.

28. To release the clutch, the plate *C*, Fig. 5, is retarded either by hand, or by a friction shoe worked from the floor. This disengages the bowl *E* (Fig. 4) from the shell or rim *A*. The bowl runs into the pocket as shown in Fig. 3, where it remains. This stops the scroll plate and causes the worm gears to revolve around the scroll, thus unwinding the screws and releasing the frictions, and stopping the driven part.

29. I will now show you the practical working (which I have attempted to explain) on the model clutch before you.

I don't know whether I can do that with the audience as it is; perhaps after the session is over I may be better able to do it, but I will try at the present time. [Illustrating with model.] It is now running empty. To start it, touch the starting plate, like that, turn it one-third of a revolution. Now it is winding up; now you can wind it as tight as ever you like. To release it, just stop the starting plate, and it is released. Now it is unwinding. That is all there is to it. I will do it again. This is a clutch pulley, or rather it is made as a clutch pulley would be made, for convenience in operation.

This shell part must always be running. This is the driving part. To start it you touch the starting plate. Now the friction is winding up. Now it is wound as hard as I can turn it. To release it, hold the starting plate like that. Now it is releasing; now it is unwound. The clutch in my mill is driving 8,000 spindles. It is 16 inches in diameter; it runs a 3½-inch shaft, which shaft runs at 350 revolutions a minute. It puts the shaft up to 350 revolutions in 20 to 30 seconds without noise, without jar, without any slip, without any heating, and drives the load so easily that if you were to see it you would come to the same conclusion that I do — that it would drive 200 horse power. That shaft has a great many belts on it and counter-belts, and it is so hard to turn that when you want to put belts on when the mill is standing, it takes two to three men pulling on the belts to move the shaft around enough for putting on a belt; while this little 16-inch clutch will put that shaft up to 350 revolutions in 30 seconds. It never slips, never heats, never gets out

of line. You can start it, as I tell you, with one finger; you can stop it with one finger. It contains only 13 parts. There is nothing to get out of order in it. We have now been running it 18 months in order to perfect it. We put the first one on a year ago last Thanksgiving, taking off the 27-inch toggle joint clutch, that would scarcely drive the load, and which often used to slip. The 18-inch clutch which we put on in place of it was all right, but it was not perfected. During the year we improved it. Last Thanksgiving we took off the 18-inch, and put on the 16, so the 16-inch is now doing with the utmost ease what the 27-inch clutch would scarcely do. When we took off the 18-inch clutch, the frictions, which are made of wood fibre, did not show the slightest sign of wear.

Mr. WALTER E. PARKER. Did I understand you to say there was no necessity of supporting the shaft each side of the clutch?

Mr. THOMAS HENRY SMITH. Oh yes, it is better to do so. If you have a cut-off coupling, where the shaft is cut, it is necessary to have two supports. With a clutch pulley the shaft is all in one piece, and does not need two bearings. With the cut-off coupling it is better to have another bearing on the outside as well. I don't suppose you understand how it is; it is a very difficult thing to understand; not because it is so complex, but because it is so simple. The difficulty in understanding it is that the clutch does so much with so little. The load is taken up by the clutch; the driving power does the winding; and the driving power also does the releasing. Not only so, but if you leave the clutch in its normal condition it will tighten itself up. But you can set it so that, if you want it to slip, it will slip. I will take it to pieces after the meeting if any of you would like to look at it, and try to make you understand how it is done.

The PRESIDENT. Are there any more questions that you will ask of Mr. SMITH?

Mr. JOHN GREGSON. Mr. President, supposing the shaft was running, and you wished to separate one part of the shaft from another, how would you do it?

Mr. THOMAS HENRY SMITH. Just the same as it is now. The shaft will be cut here and recessed into the hub of the driving part about two inches to hold the shaft; then, as Mr. PARKER suggested, put a bearing on the outside, then you have a cut-off coupling.

Mr. JOHN GREGSON. The question I ask is, if any parts of the shaft are running and you wish to stop it at once, how do you do it?

Mr. THOMAS HENRY SMITH. Is it a continuous shaft or two shafts?

Mr. JOHN GREGSON. There are two shafts coupled together and I wish to separate one pulley from the rest of the shaft.

Mr. THOMAS HENRY SMITH. You mean to stop one part of the shaft?

Mr. JOHN GREGSON. Yes, sir.

Mr. THOMAS HENRY SMITH. There it is. [Illustrating.] Now the shaft is running. All I have to do if I want to stop it is to stop the starting plate. Now it unwinds and stops it.

Mr. JOHN GREGSON. But could you do that while shaft was running?

Mr. THOMAS HENRY SMITH. Yes, certainly, of course; stop the shaft any time.

Mr. JOHN GREGSON. I have something to learn on that yet.

Mr. ARTHUR H. LOWE. How much energy does it require to hold the starting plate?

Mr. THOMAS HENRY SMITH. One finger; one finger on the starting and stopping lever. You will see how much energy it requires if you come up here. I will wind this up as tight as ever I can, and you will see how little effort it takes to release it. Now it is released; you can do it with your little finger, as far as this clutch is concerned, and on the starting lever you can move it with one finger. Take one finger, put it on, start the clutch; take another finger, put it on and put on the brake, and it will stop it.

Mr. ARTHUR H. LOWE. Isn't there any liability of its coming loose?

Mr. THOMAS HENRY SMITH. I do not see as there is. There isn't a nut or a bolt inside at all; it is made entirely without a nut or bolt; it consists of only 13 pieces, the whole thing. The power of it is simply unlimited. That 16-inch clutch will take all that a 3½-inch shaft will drive; a 20-inch clutch will take all that a 5-inch shaft will drive, and a 24 or 30-inch clutch will drive all that a 6-inch shaft will drive.

Mr. WALTER E. PARKER. When it is running, how do you take hold to stop it?

Mr. THOMAS HENRY SMITH. If it is on a shaft we have a lever hung from the ceiling. That lever has a small stud with a bowl at each end. One bowl rests on the running part, the other comes on the rim of the starting plate. You put the bowl on the shell; that turns the starting plate and it starts the clutch. The brake comes on about there — a brake about three inches long — a little bit of a leather brake about three inches long. That stops the starting plate and unwinds the clutch. When the power is winding up, the scroll plate drives the gears, expands the screws, forces the wedges out on the inclined planes

and presses the frictions against the shell of the clutch. To stop it, you stop the starting plate, disengaging the bowl from the shell; the bowl runs into the pocket, where it remains, stopping the scroll plate and causing the worm gears to revolve around the scroll, thus unwinding the screws, releasing the frictions and stopping the driven part. There is the wonderful ingenuity of it; it just reverses the operation.

Mr. ARTHUR H. LOWE. If any accident happens to your starting plate it would be impossible for you to stop it.

Mr. THOMAS HENRY SMITH. I do not see how anything could happen to it. What could happen to it? It cannot get away.

Mr. ARTHUR H. LOWE. Suppose the gears should get bound or stuck.

Mr. THOMAS HENRY SMITH. If you will come here and wind it up and then undo it, you will see there is no possibility of the gears becoming bound, because they release so easily, showing that the strain is not on the gears, but on the inclined planes and wedges. I may say that the young man who invented this clutch is a mechanical genius in his way. He is a young fellow who has never had a college education. He is making now a barrel machine which will make a flour barrel in a minute. He has been working for five years and it is now nearly perfected. The pieces of which the barrel is composed come from the machine tongued and grooved and all matched together and fastened on two hoop-irons, laid out flat like a rug. You can ship them in that form, or you can take them and put them up into barrels immediately. It is a cylindrical barrel, not a bulging one. This clutch was made as a side issue; he wanted a clutch to drive the barrel machine, and he devised this clutch for the purpose.

Mr. GEORGE P. GRANT, Jr. Was the 18-inch clutch that you made any more expensive or less, than the 27-inch?

Mr. THOMAS HENRY SMITH. It would cost less if it were properly made. The clutches that we are making now are made in a local machine shop which is not at all fitted for this sort of work. This model is made there, too. Plans have been made to make it cheaper. The machine maker tells me, by laying out jigs, etc., for it, he could make it much more cheaply. The 30-inch clutch cost me $33.00 for the machine work; the castings about $12.50. But it is not a matter of cost at all. If any one of you had a clutch like that in your mill, nobody else could give you any other after you had once seen this work.

Mr. ROBERT MCARTHUR. Is this clutch to be made in any particular place?

Mr. THOMAS HENRY SMITH. We have made six for a gas engine for an electric light plant, where they have two 70-horse power engines, one on each end of the shaft, exploding two explosions every stroke, so severe that no other clutch maker would put a clutch on. We have six of them on there, 20-inch clutches, and driving the thing very satisfactorily.

Mr. ROBERT MCARTHUR. Are any provisions being made to manufacture?

Mr. THOMAS HENRY SMITH. Not yet; nothing has been done about it yet. The thing is entirely undetermined. Now, Mr. Chairman, I will take the model to pieces when the session is over and show the members the inside of it if there are no other questions to ask. Taking it apart is a very simple affair.

The PRESIDENT. Mr. Secretary, is there anything further that you have to offer?

The SECRETARY. No further business at this session.

The PRESIDENT. The order of business is closed for this afternoon and I will declare the session adjourned till tomorrow morning at 10 o'clock.

THIRD SESSION.

THURSDAY MORNING, APRIL 25, 1901.

The Association met in Chipman Hall at 10 A. M., President THOMPSON in the chair.

The PRESIDENT. In the regular order, gentlemen, the next matter before us is a paper upon Industrial Unity, by Mr. HERBERT E. WALMSLEY of New Bedford, Mass. [Applause.]

INDUSTRIAL UNITY.

HERBERT E. WALMSLEY, New Bedford, Mass.

With the memory of a terrible strike before me, involving, as this particular strike did, the paralysis of a great industry, and the disturbance of the peace for a long drawn out and protracted period, I have, for some time past, felt that the question of industrial unity, or, otherwise expressed, industrial peace, was a perfectly legitimate topic for all to discuss and strive to realize.

It is without doubt one of the great problems of the age in which we live, worthy, I take it, the very serious consideration of all thoughtful and sober-minded men.

By some, however, it may be felt that this question, involving, as it undoubtedly does, so much of grave and momentous import, had perhaps better be left to such men as CARLYLE, RUSKIN and EMERSON, or men of equally big brains and big hearts; personally, I believe the matter is one peculiarly *ours* to grapple with, from the very fact that we ourselves, and the multitudes associated with us in our daily life and our daily work, are the ones it most directly affects: hence, I make no apology for inviting the attention of this Association to the subject.

According to the last census, the population of the United States now stands at seventy-six millions and a quarter.

Statistics are frequently merely dull and repellent hosts of figures; occasionally they strike home upon the imagination, and leave a vivid impression on the mind.

No thoughtful person can fail to realize something, at least, of all that is signified by the last numbering of the people.

In the short space of ten years, there has been an increase of nearly thirteen millions and a quarter, which is equivalent to almost 21 per cent. for the decade; when we remember that two hundred years ago the population of the United States was under 300,000 and that one hundred years ago it was but little over five millions, it will be seen with what amazing rapidity the young giant among the nations has built up his strength; the important fact is that there are thirteen millions more people owning allegiance to the American constitution than there were ten years ago; and the growth of the population is the infallible test of national prosperity and advancement; no nation has ever yet risen to greatness with a dwindling population and probably never will; Americans, therefore, may be well content with the progress they have made in the last decade; these figures afford ample reason for pride and jubilation.

The only great power of the present day which can vie with us in numbers is Russia, but in wealth, in energy, in adaptability, in education, and in that cunning industrial skill which is the foundation of material prosperity, how great the contrast; what the future has in store for the United States, only the future can disclose, but that it is something great, something vast and magnificent, far beyond anything hitherto witnessed in history no one can doubt.

The United States is practically upon a level with Great Britain in coal production, and ahead in iron and steel production, and, of course, in agricultural output the exports, notwithstanding the magnitude of the home market, are enormous.

Even Great Britain, as well as Germany and other countries, are now borrowing money from the United States.

Remarkable indeed is it that mankind has so slowly learned that industry and commerce — not warfare — is the true source of wealth and we can see how great empires in the past have failed through the slight regard which has been paid to industry.

RUSKIN, I suppose one of the profoundest thinkers and most

eloquent writers of the 19th century, says: "Five great intellectual professions relating to daily necessities of life have hitherto existed in every civilized nation: The soldier's profession is *to defend it;* the pastor's *to teach it;* the physician's *to keep it in health;* the lawyer's *to enforce justice in it;* the manufacturer's *to provide for it;* observe, the manufacturer's function is to provide for the nation": that is to say, he has to understand to their very root the qualities of the thing he deals in, and the means of obtaining or producing it, and he has to apply all his sagacity and energy to the producing and obtaining it in perfect state and distributing it at the cheapest possible price where it is most needed.

He goes on to say "and because the production or obtaining of any commodity involves necessarily the agency of many lives and hands, the merchant — or manufacturer — becomes the master and governor of large masses of men in a more direct, though less confessed way, than a military officer or pastor; so that on him falls, in great part, the responsibility for the kind of life they lead; and it becomes his duty, not only to be always considering how to produce what he sells in the purest and cheapest forms, but how to make the various employments involved in the production, or transference of it, most beneficial to the men employed."

In so far as this sentiment is concerned, I do not suppose in this assembly any dissentient voice will be raised; nay, further, I venture to affirm that this same sentiment animates and influences the great majority of employers in their relations with the employed.

In this last century, we have been enabled to record an advance — I believe simultaneous in all directions; never did a people enjoy an advance more real in wealth and comfort than our people in the 19th century; never have we seen greater intellectural achievements; never, I believe, has there been a greater awakening to a sense of responsibility and of brotherhood than we have witnessed in our generation.

The United States of America supplies many of the most in-

structive instances of the latest economic tendencies of the age, such as the growing democracy of trade and industry, and the development of speculation and trade combination in every form.

She now holds a position of commanding influence in the world of commerce, and she will probably, before long, take the chief part in pioneering the way for the rest of the world.

If this huge task of providing for the seventy-six millions of our own people, aye, and for other nations, is to be profitably and successfully accomplished, it is obvious that one prime factor is absolutely essential — in the absence of which our efforts are doomed, if not to failure, at any rate to only partial achievement, and that prime factor is, *Industrial Peace.*

It is generally conceded that from ignorance of the fundamental truths of political economy arise many of the worst social evils, discouraging failure in many well-intended measures, opposition to improvements, disastrous strikes and lock-outs.

Let us for a moment glance at one or two of these fundamental truths. Wealth is produced by the coöperation of labor and capital with nature; there are three indispensible factors involved in productive industry: namely, labor, capital and management, or, otherwise expressed, labor, abstinence, ability and risk.

The two important points for our consideration at this present moment are:

1st. The fallacy still unfortunately very prevalent that capital and labor are antagonistic.

2nd. What share of the wealth produced by the coöperation of capital and labor shall go to the remuneration for labor?

Differences of view on these two points may be said to be the main cause of industrial disputes.

To recapitulate: All wealth is the product of man's labor, employed on the products of nature.

But while laboring, the laborer must be fed and maintained and, therefore, some of the produce of past labor must be saved from consumption for this purpose.

Capital is thus saving, and consists of that part of wealth which is not consumed unproductively, but saved in order to assist future production.

Capital only fulfills its functions when it is consumed in the creation of fresh wealth; out of this freshly created wealth comes an increase for the remuneration of the wage earning class.

The production of capital must be estimated by the amount of wealth created by it, not by the return to the capitalist — the productiveness of capital is increased by the employment of skilled labor, and by the use of machinery, which may increase the productiveness of capital from one to a hundred fold.

As every business man is aware, success in commercial matters breeds expense and requires to be fed by the perpetual absorption of fresh capital; failing this fresh supply industry languishes, but for these reserves of capital, the machinery and other plant, whereby the amount of wealth is so largely augmented — a portion of which augmented wealth goes to the wage-earning class — could not be provided; thus we see how closely inter-related and inter-dependent are capital and labor; rightly speaking, they are not and cannot be antagonistic.

Again, capital which is the result of saving can only be increased by increased saving; men save for two motives:

1st. As a prudent provision for the future.

2nd. In order to make wealth by an advantageous investment.

It is hardly necessary to point out that the man who saves, and so finds the necessary capital, without which industrial enterprise is crippled, or completely paralyzed, is a more profitable member of society than the man who wastes; one has the desire and the will to save, the other has neither; one possesses capacity and merit, the other neither; the history of mankind teaches that the reward has ever been to ability and merit.

The community benefits by capital being abundant; the first business of those who enter upon industrial undertakings is to assure themselves that the money which is necessary to start them can be raised and, further, raised on fairly easy terms;

accumulated capital on which industry depends for profitable employment implies great savings and great savings mean abundance of money waiting for a borrower; the capitalist alone makes the industrial growth of the community possible, because he alone provided the condition precedent of industrial growth, namely the capital which makes industry possible by supplying it with the necessary plant.

The community to be prosperous requires reserves of capital, a truth which every economist acknowledges when he praises the thriftiness of a nation like the French, which enables it practically, at a moment's notice, to produce some 350 millions of dollars for an undertaking like the Panama Canal, or when the economist extols the company or corporation which locks up half the dividends it might distribute to form a great reserve, the money is sure to flow out at last, and probably when it is required by some industrial undertaking or contingency.

Capital and labor, that is enterprise and energy, build our cities and rear our manufactories; they whiten the ocean with their sails; they blacken the heavens with the smoke of their steam vessels and furnace fires; they draw treasures from the mine, they plough the earth from East to West, they have converted a wilderness into a garden yielding cotton, fruits and corn —*together* they have done this thing; the union of capitalists and laborers is in the highest sense a partnership and an indispensable partnership; the laborers finding the strength, the patience, the manual skill, the physical exhaustion; the capitalist finding the management, the executive ability, the machinery, the immediate means of subsistance.

When capital is prosperous, labor is prosperous; when capital is prostrate, labor is prostrate; one cannot have good or bad fortune without the other; the welfare of each is daily more involved in the welfare of both alike.

What are the forces which determine the wages of the great mass of the people; or those who are spoken of as the industrial classes?

This is, perhaps, the most important question in political econ-

omy, and it is one of the most difficult to answer; it is without doubt the main cause of our industrial disputes.

The political economists, thinkers to whom we may reasonably look for guidance, have at different times attempted to give us a solution; but without success, I fear.

If it were possible to secure the establishment and general recognition of a normal standard wage, it would doubtless tend to settle many industrial disputes; but here again comes up the crux: how are we to arrive at the imaginary settled center?

If only a single trade be taken, wages are found to vary here and there at the same time, according to many local conditions, personal relationships, varying standards of payment by time or piece and a vast number of other causes, that no alleged average of the mass can be relied upon to give us accurate guidance as to the problem arising in that trade in respect of wages at any particular time and place.

When the inquiry is extended to all trades and industries, with their enormous variations, the attempt to arrive at an imaginary settled center, an average that will not necessarily and probably does not represent the facts in any single one of the trades, included in it, fails to give us a basis for practical guidance.

Labor is constituted of millions of separate human beings working under such diverse conditions that, in many cases, it is impossible to make even a sectional grouping of them for the purpose of a common calculation.

History tells us that very many years ago there lived a cynic philosopher known by the name of Diogenes; on one occasion he was discovered by his friends wandering about the streets in the day time with a lantern, peering here and there, or making pretence of so doing; asked for an explanation of his singular behavior, he replied that he was searching for an honest man.

Our case is not so bad as that of Diogenes; we have plenty of honest and honorable men on both sides, among employers and employed alike; but, like Diogenes, we are waiting and looking for one who will solve for us this complex problem of

the "Remuneration for Labor;" when he comes along he will be acclaimed a public benefactor.

Every industrial dispute is a tragedy, made up of an infinite number of smaller tragedies.

Here are two bodies of men, whose interests are practically identical, in a state of hostility, each persuaded that his cause is just, and each expressing the determination to pursue the contest to the bitter end.

It is obvious that it occurs to neither that each may be partly in the right, and each in the wrong.

In correct observation and correct drawing of inferences there needs the calmness that is ready to recognize or to infer one truth as readily as another — on the contrary, how reluctant is each of the contestants to draw any conclusion but that which he has already drawn; each combatant seeing clearly his own aspect of the question has charged his opponent with stupidity or dishonesty in not seeing the same aspect of it; while each has wanted the candor to go over to his opponent's side and find out how it was that he saw everything so differently.

Clearly then where personal interests come into play, there must be even in men intending to be truthful and just a great readiness to see the facts which it is convenient to see, and such reluctance to see opposite facts, as will prevent much activity in looking for them; there tends too often to be generated an animosity fatal to a just estimate of either party by the other.

Let us then endeavor to put forward the means that are best adapted for bringing about a fair and equitable settlement of the disputes dissevering these two inter-related social forces — capital an labor — in proportion as these matters are so decided, will the work of the nation prosper and the condition of the people improve.

Humanity learns by experience; the failures of one generation are not lost on after men — we set new ends before ourselves, as worthy our national effort, and therefore we have to select new means as the best for pursuing them.

The national genius is not merely embodied in the consttitu-

tion and laws of the country, it is breathing in the hearts and work of the present generation of citizens, and thus it is that the convictions of the public come to mould and alter the forms in which our national life is cast — public opinion becomes in this land the ultimate court of appeal.

The solution of these problems may some day, perhaps, be found in the plan of arbitration, when, if the plan be tried fairly, because willingly, it will be known how it acts, under the most favorable circumstances, it will also be known what defects demand a remedy and this without dislocating the ordinary course of business, or introducing a new element of uncertainty into the conduct of trade.

Again, the solution may be found in the system of Industrial co-partnership; it has for some time past been the conclusion of the most sober-minded economical thinkers that the relations of employers and employed must be supplemented in time by that of working partnership.

We must, however, in the complicated and dangerous process of the transformation of industry be content to hurry slowly, realizing as we do and must how great are the difficulties surrounding these delicate, difficult and vexed questions.

Gentlemen, those who have eyes to see and ears to hear cannot fail to realize that the great commercial struggle of all history is opening; nothing then is of more vital importance to the future welfare, advancement and prosperity of this great nation than the maintenance of industrial peace; let us, therefore, see to it that there be no breach in our ranks or if one unhappily arise that it be quickly closed.

No more lamentable and disastrous spectacle can be witnessed than that of the hand of industry standing idle in the market place.

The PRESIDENT. Gentlemen, the subject just presented to you of Industrial Unity, all, of course, agree is very important, and very likely some of you may wish to make some remarks upon it. I await your pleasure.

No discussion.

The PRESIDENT. It is to be conceded that the books are behind the practice of mechanical art. The Corliss Engine with a variable cut-off controlled by a governor revolutionized the practice of steam; and yet that mechanism was not described in any published book until 30 years after its invention, and that writer was an English clergyman with leanings towards engineering. I refer to Rev. ARTHUR RIGG, author of "Rigg on the Steam Engine", who was unaware of his pioneer work as an author for many years after the publication of his book. The rapidity of the changes due to the application of the governor to the cut-off is shown by the fact that our next speaker set up and operated the first automatic cut-off engine west of the Alleghanies.

I have the pleasure of introducing to you, Mr. OROSCO C. WOOLSON, of New York, who will speak on Possible Additional Economies at the Steam End of the Mill.

Mr. OROSCO C. WOOLSON. Mr. President and gentlemen, let me begin by saying that I was brought up in a town not far from this city of Boston, and when a boy, I had my share of cutting ice and breaking out roads and other similar recreations. I grew up to regard Massachusetts as a pretty cold state. But it never impressed me with being abnormally cold or that there was a localization of this low temperature in Boston until a few days ago, when I received a letter from your Secretary stating that your Association would be pleased to have a paper prepared by me and ready for the 70th meeting, and mildly remarking that this would take place on the 24th and 25th of the present month, and that he would like the manuscript as early as convenient for advance publication. The redeeming feature

was that I could choose my subject. I began to realize that my early experience with the temperature of Massachusetts was not a circumstance with your Secretary's office. Had it not been that I was familiar with an experience that your Mr. WOODBURY once had in being similarly cornered when requested to preside at a convention of engineers out in Pennsylvania only two hours before it was to be called to order, and how he came near having a congestive chill because of the demand made upon him — at any rate, he hustled to gather himself together for the opening address in which he cordially thanked the wrong man who offered to subscribe to the local committee to keep the engineers out of town — except for this, I say, I should have begged to be excused and asked that I might have the honor of presenting a paper at some subsequent meeting, but not at this. I will ask your indulgence, therefore, in what I have to present.

POSSIBLE ADDITIONAL ECONOMIES AT THE STEAM END OF THE MILL.

OROSCO C. WOOLSON, Constructing Engineer and Contractor, Havemeyer Building, New York, N. Y.

I have taken for my subject, "Possible Additional Economies at the Steam End of the Mill," and if I have omitted tables of tests, columns of statistics and a mass of figures generally, which usually are so edifying, I will try and make up for it in some other way. For myself I have listened to so much of that during the past twenty-five years, that it has made me prematurely gray.

I will present first an allegory entitled:

"THE KING AND HIS LOYAL SUBJECTS."

King Cotton, who was wise and progressive, sat studying over the welfare of his subjects, endeavoring to make clear to his mind how he could best serve them as a whole, and incidentally how he could increase the state's revenue. All sorts of propositions had been presented to him, none of which had found favor with his councillors. Still, he felt that the world moved and he should move with it, yet there were among his councillors many who had grown gray in following in the ruts of others in a sort of indifferent, meaningless way, apparently not realizing that the world moves, and completely overlooking the fact that the whole course of their existence was one continuous development, and while they plainly saw that it was the pride of their king to become a potent factor in this development, they took

equal pride in accepting things as they found them and made the best of it, regarding it as a virtue in so doing.

Many arguments did this King have with his councillors, each of whom considered himself the embodiment of practical wisdom, and in their several capacities were permitted to expound that wisdom to their King, always resulting, however, in the rejection of their advise. They told the King that things were good enough as they were, but if the state must have greater revenue, then secure it by an arbitrary increase of the tax rate.

"No," said the King, "this will defeat one great object I have in view — the betterment of my subjects, not the oppression of them. The great mills in my kingdom are supplying the material for covering this nakedness, and if I had given heed to your counsel the past generation, my subjects would be still clothed in their birthday suits, or, the wives at best would be turning the spinning wheel."

"No, my Lords, you must not counsel me thus, but devote yourselves to study and prayer, investigation and travel, until I call you for further consultation. In the meantime I shall go among my people and gather information to present to you." So the councillors withdrew to confer among themseves and to marvel at their King's persistence. "Can it be," they said, "that our King has already been among his people and knows of their requirements, and is conscious of their inability to be further taxed without an equivalent return in improved methods and machinery. True, this is a big kingdom and little do we know personally of the actual conditions that exist in the far-off country. We are holding our positions by his grace and our royal blood, and can it be possible that we have overlooked the fact that this world does move, and we not know it?"

The King, although a wise ruler, was subject at times to morbid moments, and like most people under such spells, would for the time give way and grow heartsick to realize that possibly he was wrong and that his councillors were right, and during one of these spells he was seized with a desire to summon one of his subjects before him that he might gain new trains of thought

and possibly gather still further knowledge with which to combat his councillors. So at an appointed time a strong, honest workingman, just as he was found in one of the great mills of the kingdom, was brought into his presence, his trousers rolled up and his body stripped to the waist, and covered with soot and dust, not so thick, however, but that the King quickly saw the great strength of the man, for his muscles stood out in big lumps on his arms and shoulders, and his face was burned and scarred by the intense heat of the severe labor that he was daily subjected to. His general appearance, too, was such that it was evident he worked very hard for the money earned to support himself and family.

Struck with compassion at one moment and with disgust at the next to realize that even one of his subjects, brawny man that he was, yet made of the same blood, flesh and bone as himself, and possibly possessed of a kindly heart, should find it necessary to labor in this merciless manner, the King was more fully convinced than ever that his councillors were wrong and that he was right, and he began to question his subject.

"Tell me, my good man," said the King, "at what you labor, and what money is paid to you for this labor, which, to me, looks as if it were hard and dirty, and if you are contented with your lot."

"Oh, Sire," said the man, "I have to do with shovelling a black dirt which they call coal out in the country where it grows, but here, at one of the great mills of your kingdom, it is called many things not fit for kingly ear to hear, and it is made use of for producing steam for the mill and smoke for your kingdom, but which gets the greatest amount of the resultant, I am not a scholar sufficient to tell; but, Sire, my honest impression is your kingdom gets the most and will continue to do so unless your subjects rise up in righteous wrath and demand that the mill appropriate to its own use that for which it has paid good money, and to which you, oh, Sire, are not entitled, and against which you should protest for the sake of your humble subjects who are powerless to protect themselves, and for the sake of

your mill owners who are ignorantly and wilfully throwing money away broadcast over your fair kingdom, making the exterior of your palaces, even at this early day, resemble the inferno in which I seem destined to pass my existence."

"The money paid to me, oh, Sire, is not what I would desire to properly clothe and educate my family, but with it I must be satisfied. Therefore my answer to you is, that I am content, but may I ask, are you satisfied with me and with the general results?"

"This is indeed honest talk, my good man, although it sounds strange to my ears, and I am little used to being questioned by my subjects. Nay, more, the affairs of state are arduous and afford me little time to look closely into the individual welfare of my subjects, the collection of revenues and supervision of disbursements so fully occupy my time that I neglect, 'tis true, matters of grave importance."

"Still, let me tell you, my good man, that I have sent for you to listen kindly to all you have to say, but first let me say a few things that may arouse in you a certain faculty, God hath endowed you with — and which, in your present lot, you have but little use for — that is, the faculty of thought."

"You can lift a great weight of coal, or dirt as you term it, and heave it either into your wheelbarrow or into the furnace. I could not. On the other hand, I can determine with mathematical precision how much revenue the state requires to pay its fixed charges and to pay a satisfactory profit to my subjects; you could not. Now each of us has simply used certain faculties, both of which you and I possess in different degrees."

"Time has now come, my good man, when you must use more of your faculties, and I may explain to you certain things at this time which will necessarily awaken in you the faculty of thought, and as my proposition begins to dawn upon you it may at first fill you with consternation, but upon mature reflection you will see the wisdom of it."

"I will say to you further, that it is my desire to better the

condition of my kingdom, and this can only be accomplished by dealing with the individual subject."

"In the first place, to better my kingdom, I must raise a greater revenue. I have had this subject in contemplation a long time, and have discussed the problem with my councillors, but as yet have arrived at no satisfactory conclusions. My councillors oppose me; they receive good salaries and are not weighted with the responsibility to others that I am. They are at the present time communing together on this same subject, and I bade them devote themselves prayerfully to this duty until I called them. Now, my good man, have you nothing to suggest?"

To this the man could make no prompt reply, and the King seeing his difficulty continued:

"It is true," he said, "were I to reduce the pay of all the wage earners in my kingdom it would be equivalent to an increased revenue to the state, but that does not seem to me necessary, and is not reaching a solution of the problem in a scientific manner. I am fully convinced that you and your co-laborers are not working to advantage. It is all muscle and too little brain force. Consider for a moment the great improvements that the brains of my subjects have wrought in cotton machinery. Is it possible you see no difference between the spinning wheel of my kingly ancestors and those of today, and yet can you claim equal progress in your dirty department?"

By this time the soot begrimed man had found words to express himself, "Oh, sire, I do acknowledge that my first thought was that all wages should be reduced, thereby affording the necessary revenue; but when I thought of my wife and children, I could not speak. But, by that faculty which you say every man possesses, but so few employ in their everyday life, I have been seized with new emotions and a desire to express myself, not from your standpoint, oh Sire, but from my humble position in the furnace room of the great mill of your state."

"Speak! man, for I can read your thoughts. You mean to

suggest that I should order the working force reduced and throw out of employment at least half the men in your department, and yet produce better results than are obtained today."

"Oh, wise King," replied the man, "These are my thoughts, but by your presence I have grown in knowledge and can see daylight through this dim and smoky atmosphere, and I realize how it is possible for me to get increased pay for my labor while you get increased revenue for your state. To accomplish which, however, means that money must be judiciously spent, and possibly several men must be shifted to other departments."

The King was astonished at the bold honesty of his subject, but it was due not so much to his boldness as to the awakening of a dormant intellect, for the King had given opportunity for this intellect to assert itself, and he encouraged the man to continue.

"My proposition, oh, Sire, is perfectly rational. Permit me to explain to you in detail. First, let me begin by saying that I have not always been the rough sooty man that I appear to be, although always a fireman, shoveling coal into a furnace, where it decomposed and burned up, yet we had at one time a different kind of coal to that we are obliged to use at present; it was clean and bright, and as nice to handle as sand. The hard, laborious part then was to break up and get out of the furnace the residuum which was left after combustion had taken place. This varied with different qualities of coal. Still, the method of treatment was practically the same. Fires were started clean in the morning and coal was shoveled into the furnaces steadily till noon, when a general cleaning-out time came. Shoveling the coal was fun, although it would burn one's face and arms in doing it and permit great volumes of air to rush into the furnace and lower the temperature within to an alarming degree, but the cleaning of fires was killing. Working a furnace in this way was not science, but brutality; still I did it for the pay that was in it and the trade it gave me."

"The time came, however, in the increase of business, when it was impossible to keep up steam with a coal that was so

greatly lacking in heat units and so full of foreign substances. Investigation had shown that soft coal, known as bituminous, was much higher in heat units, therefore a pound of it would boil more water than a pound of the hard, or anthracite, and forthwith we found ourselves burning this bituminous coal and making the steam then required. But it was evident that we were dealing with a different substance, yet not being familiar with its constituents we continued with the same labor, with the same shovel, with the same wheelbarrow, and what was of greater importance, we continued to use the same character of furnace."

"With many people coal is coal whether it be anthracite or bituminous, and yet here are two elements that are as much unlike in character as can be, and yet both are black and both are consumed by heat."

"With your permission, oh, Sire, I will put into your hands good authorities on this important subject of proper and economical treatment of fuels and respectfully suggest for the good of your kingdom and peace to your mind, that you investigate and learn what others are doing and have been doing for the past fifteen or twenty years, where this same black bituminous coal is all they ever have to make steam for factories quite as large as any in your immediate kingdom and where, were they obliged to use for fuel the same hard, clean, indifferent coal that was once so familiar to your subjects, they would doubtless be guilty of as great errors as we have ever been and continue being guilty today."

"I know, oh, King, what efforts have been made by certain of your subjects to solve this great problem of properly decomposing bituminous coal, and I am familiar with the very indifferent success that has attended these efforts, but, oh, King, study the authorities on the subject and learn for yourself wherein your subjects have erred, for it is so plain that 'he who runs can read', yet condemn them not, oh, Sire, but rather he whom force of circumstances and 'underfeed' existence has been endowed with a glib tongue and an elastic 'downdraft' conscience, for it

is he who hath so *warped* and *twisted* and *figured* and *tested*; and *tested* and *figured* and *twisted* and *warped* the subject out of all resemblance to anything laid down by good authorities for our guidance."

The King took these authorities and began their study, and he found "that anthracite coal burns completely with a thin fire by admitting an excess of air through it and above it, but bituminous coal absolutely requires for its perfect combustion a high temperature and plenty of room for the products of combustion before coming into contact with the iron of the boiler, together with a proper supply of air above the fuel, and any deviation from these conditions produces smoke and loss of heat, and smoke is a sure evidence of imperfect combustion."

"The combustion of coal seems to be, to a great extent, a mystery even with those who profess to understand it, as appears from the contradictory plans proposed to effect complete combustion."

Again, the King reads: "Chemistry, however, in a few simple principles, unfolds the whole philosophy of combustion."

"Coal is a compound substance, and may be decomposed by heat into several distinct elements. As far as regards combustion (bituminous coal) we have to deal principally with two of these only, viz.: Carbon in the form of coke, and hydrogen, generally known as 'gas'. These two elements practically contain the full heating properties of the coal. If we do not obstruct the processes in which they enter into combustion, they will naturally be completely burned, and consequently will impart their full measure of heat and will make no smoke."

"Now, what is the operation of 'burning?' We say that when coal is thrown upon a fire it begins to "burn". But before any burning can possibly commence, the coal must suffer the preparatory process of decomposition. Its constituent elements must be separated, and then a regular order of precedence obtains in their combustion. The burning, which then takes place, is this: the gas, which, having been distilled, burns first, does so merely by its chemical union with the invisible oxygen

of the air, forming water (or steam). The gas having been burned, the coke takes its turn, and burns in exactly the same manner by combination with air, forming carbonic acid."

"Now, if the gas does not have sufficient time to enter into complete mixture, atom by atom, with the air while *both* are within the range of an igniting temperature, they will *produce smoke*."

"The heat under which the gas itself distills will always ignite it, if the due admixture of air is immediately obtained. If the access or mixture of air is delayed until the gas has risen beyond the reach of an igniting temperature, it will then pass away unburned, and it is by far the most rational plan to effect the immediate admixture with air while the gas is ready to burn, than, neglecting this mixture, to endeavor to recover lost time by *heating* the gas afterwards, when it may be supposed to have fortuitously taken up its equivalent of air."

"It is evident that to bring the coal, in both its solid and gaseous elements, into intimate mixture with air, and to ignite the compound, are all that human means can accomplish—nature only, in her own processess, effecting the rest. The distillation of gas when fresh coal is supplied, goes on near the surface of the fire; the gas naturally burns above the surface, and the air necessary for its combustion must be admitted, therefore, above the surface."

"The question is often asked, 'Why not provide at once for the admission, through the grate, of sufficient air both for the coke and the gas?' This would be an impossibility, for whatever the quantity of air admitted through the grate, it will expend itself on the *coke* only—at least until holes are burned through the fire, when the control of the air is at once lost, and great waste of fuel ensues."

"The admission of air above the fire must be in the greatest practical number of small jets, since gas and air mix only gradually, excepting by division and inducement. Air, *in bulk*, mixes only superficially with gas, and by abstracting heat cools the furnace. The air holes should be placed as near as

practicable to where the gases rise, since after they are disengaged from the coal, it is necessary to *commence* their combustion at the earliest moment. Gases, to be thoroughly burned in the furnace, must be intercepted by air at the *start*, else the combination, which is at best gradual will not be *completed* in season, as what remains uncombined on reaching the *tubes* is lost."

The King having read and re-read these passages, began to feel very much as his brawny subject did when his Majesty unfolded new ideas to him about employing his faculties of thought and utilizing his brain to relieve his muscles. He, therefore, sent for his councillors to appear before him. All but two responded and it was then learned that these two had gone on a journey to distant parts of the kingdom to learn for themselves what methods others had adopted, and which the King could adopt, to increase his revenue as well as to better the condition of the brawny and smoke-begrimed firemen in the mills about him.

To pass the time profitably, while awaiting the return of his two councillors, the King produced the authorities he had received and requested that his councillors should familiarize themselves with what was written on the subject about the proper and economical combustion of bituminous coal, so that upon the return of their colleagues, they would be able to appreciate and explain from their theoretical knowledge that which would be told to them concerning the practical features of the particular furnace they had traveled so far to investigate, for the King, in his wisdom, had explained to them that theory and practice must always agree when each is correct.

Upon the return of the two councillors their practical knowledge was laid before the King and they all marvelled and were sceptical at first, but a studious comparison of theory and practice was made, and to their amazement they were found to agree.

Gentlemen of the New England Cotton Manufacturers' Association:

I can stand before you today and say without fear of contradiction that there is not a machine in existence that embodies in its construction so many features coincident with the best theory of combustion as the Murphy Automatic Smokeless Furnace, and that that furnace as built today has no equal either for economy, for capacity, for maintenance, or for general satisfaction in everyday work.

These machines have been before the Western public for nearly twenty years, and although I presume it would be difficult to see much resemblance between a Murphy furnace of 1883 and one of 1901, except in the one peculiarity of its transverse inclined grates and its peculiarly constructed air ducts, yet the same parties that bought them then are buying them today.

I have the honor of being the first Eastern man to systematically devote his time in showing up this furnace to the Eastern people.

It is no trouble and scarcely any expense to sell these furnaces west of Cleveland or even as far east as Buffalo, at which place I installed 1,000 horse power a year ago for the Wagner Palace Car Company, but in this part of the country, however, the steam users have been so thoroughly saturated with the so-called mechanical stokers, underfeed and downdraft furnaces of different sorts that it is hard to overcome their prejudices.

I would like to mention one thing which is very significant, and that is, when sufficient time is devoted to investigation by the councillors, urged on by the King, there is no trouble to do business.

A striking example of this is in the case of the firm of Beebe & Webber of Holyoke. A member of this firm, I am told, saw these Murphy furnaces somewhere out West, and immediately upon his return ordered one for their mill, and it is now running. Again, Mr. CAMPBELL of the Woonsocket Press and Machine Company did the same thing, and this you understand was accomplished without solicitation. The best friends I have

in the trade today are those for whom we have installed these furnaces. Two years ago I contracted with the Ruppert Ice Company of New York for 2,000 horse power. Since then, their constructing engineer voluntarily gave me a contract for another ice plant in Philadelphia, of which I knew nothing and within a month a connection of the Ruppert concern gave me an order for 500 horse power which will be installed this month. I will not dwell on this matter, and only mention the fact, as I do, to emphasize the foregoing. And I can conscientiously say I believe this would be the experience of every mill in the King's realm were the councillors bidden to investigate.

I do not wish to go into a lengthy description of the Murphy furnace in this paper but will reserve it for those who express themselves as particularly interested to know about it. Still, there are several features that I must call attention to here.

To begin with we must not lose sight of the fact that we are dealing with bituminous coal and not anthracite, and it is as unwise to attempt to decompose and get good results with bituminous coal in a properly constructed anthracite furnace as it would be for you to use a "duck loom" to turn out coarse brown sheeting. If your product is to be cotton duck then you will fit up your mill with duck looms, but if you were to change your product all over to print cloth goods, would you consider it wise to try and make shift with your duck looms or would you put in print cloth looms? My impression is you would put in the latter, especially if competition were strong and prices close and your stockholders looked for dividends.

Experience shows and the best authorities on the subject teach, that bituminous coal must have sufficient time to distill its gases—do not forget that word *time*—and not be subject to incrustation. It must have an excess of air supplied to it. Where? Under the grate alone? No. Through the furnace door? No. Through a hollow bridge wall? No. But immediately above the location of free distillation. Nor is this all, for the manner of admitting this air is of great importance, and this manner consists of so minutely subdividing this air that it

will reach the most perfect chemical association with the gas from the coal that is possible in the shortest space of time, the air to be admitted under the grates being done in the ordinary way.

Further, this gas must not be permitted to come in contact with the iron of the boiler until complete combustion has taken place, at which period the maximum temperature has been reached and the greatest effect is to be expected from the result.

Again, all coal has incorporated with it a certain amount of foreign substance which will not burn but will melt and clog up the air passages through the grates, and a peculiar and constant motion must be given these grates to enable them at all times to be kept clear.

There are kinds of coal which are so full of sulphur and iron that slag forms abnormally rapidly on the grates and under such conditions the quickest and easiest and most practical way is to open the furnace door and rake it straight out, but in doing so you have not torn your fire all to pieces or caused the furnace to smoke, or changed in any way its normal working. Your fireman has simply done a little tooling that, under ordinary conditions, he does not have to do.

I hear occasionally from certain quarters that our arches will fall down. I want to say a Murphy arch never falls down. I have in the Ruppert ice plant arches that are eight feet across and eight feet deep, and they look today as well as they did a year ago, and I shall not look for any renewal for the next three to five years.

The other interesting comment I have heard is that our coal magazines will burn up or burn out. So will your house or your mill if you set it on fire. There is no more reason why a fireman should let his magazine burn up than that you should burn up your mill, but as a matter of fact the magazines never do burn up.

If I tell you that one can almost crawl into a Murphy magazine, after the coal is almost worked out and scarcely burn his clothes you would doubtless be surprised, for the temperature

scarcely a foot away is in the neighborhood of 2,000 degrees, yet such is the case, and it arises from the fact that all currents of air which are strong, blow away from this magazine, and the coal immediately at the magazine's mouth is undergoing distillation, and coal in that condition could be grasped by the hand were it possible to do so without coming in contact with the ignited gas.

I have now Kiplingized the most important feature of "possible additional economies at the steam end of the mill," but there are other features of a steam plant that much money can be saved in, and I have accompanied this paper with several cuts to illustrate features of great importance.

When I walk through some of your elegant mills and extensive boiler rooms and see in the latter the long rows of boilers beautifully set in line with more or less polished brass piping and ornamented fronts, and watch your small army of firemen handling their shovels or tooling their fires in the old fashioned way, I am filled with admiration and regret at the same time. If I stand there long enough, regret predominates and admiration leaves me, but I turn and pass on to see what modern facilities you have for bringing your coal to these men and what do I see? Can you imagine what my sensation is? Can it be a transformation of regret to admiration? Well, I wish I could say it.

Let me present a little ancient and modern history:

Before the introduction of coal handling machinery coal was generally dumped out of railroad cars on to a convenient place near the boiler house, whence it was carried into the boiler house as wanted by means of wheelbarrows, and then fed by hand to the boilers. As the boiler plants increased in size, the cost of getting larger quantities of coal out of the cars into a storage pile proportionately increased, and machinery was used to a small extent in forming large pipes of coal adjacent to the railway.

After the introduction of hopper-bottom railroad cars machinery was extensively used for taking the coal from a track hopper

underneath the cars to the storage pile, and also from the storage pile into the boiler room, dumping it along in front of the boilers. In many cases the coal was taken from the storage pile, which might be in the shape of a covered-in pocket, and carried into the boiler room in charging cars (see cut) from which the coal was shoveled directly into the furnaces. These cars traveled on narrow guage tracks, set down into the boiler room floor, with necessary turntables wherever desired.

A still further improvement was that of drawing the coal by machinery from the storage pocket or pile and distributing it either in large piles in front of the furnaces or else into an elevated pocket, which fed the coal down through a spout to a point about a foot above the ground, from which it was shoveled into the furnaces, keeping a constant pyramid of coal on the floor at the foot of the spout.

After the introduction of various kinds of stokers it became necessary, as a further saving in cost and also to facilitate the operation of the stoker, to have the coal fed from the elevated pockets in the boiler house directly into the chamber of the stokers, thus doing away with almost all the manual labor connected with the feeding of the furnaces.

The introduction of mechanical furnaces and stokers frequently necessitated the use of crushed coal, but there are many soft coals that have but a small percentage of lump and a crusher is not needed. Slack and bituminous coal will in a few years find a larger market through the East. Lump coal is either crushed by means of a mechanical crusher after it leaves the freight car and before it is carried to the stock pile, or else when it is taken from the stock pile and before it is carried to the elevated pocket in the boiler room.

The most modern machinery receives the coal into buckets from either the cars or the stock pile, elevates it up to the boiler house pocket, the same buckets then passing around underneath the boilers, takes out the ashes and elevates them to a small bin, from which they can be drawn away. Such a plant is well illustrated by the enclosed cut (Jacob Ruppert's Ice Plant).

It is advisable, however, wherever possible, that the coal handling machinery and ash handling machinery be kept separate, as ashes are very deteriorating to any kind of running machinery, and in order to carry a small quantity of ash a short distance, where both are to be carried in the same machine, it is necessary to make the entire machine extra strong and provide larger wearing surfaces than would be necessary if the coal alone were carried. It is therefore a better practice to instal a small system of ash handling machinery, especially prepared for the purpose.

Possibly, some of your mills are equipped with modern coal and ash handling machinery, but to see your long line of boilers being supplied with coal hauled from 100 to 500 feet in a cart which has been filled by hand, or it may be in a car which has been filled in the same ancient way, run on a narrow guage track and from this car shoveled out on to the boiler room floor, and from there again lifted in a coal scoop and thrown into the furnace, my feelings begin to turn from regret into pity.

It goes without saying, perhaps, that different conditions require different treatment, but on general principles it is sound doctrine not to lift your coal up or dump your coal down except in as direct a line as is consistent with elevator and conveyor system, from the boat or car to the furnace. The ideal plant would be of course one that permitted the opening of the trap in the car and thus drop the coal directly into the furnace, and the nearer we can approach to that the more economically we can operate.

While discussing this feature of the "steam end of the mill" I am not unmindful of the fact that you have large and expensive establishments and that your plant has been a gradual growth, resulting in many cases, no doubt, in finding your boiler room at the present time in a most undesirable locality. But there it is, and it simply exemplifies what the Dutchman said, "the older what a man grows the more he finds by gracious out", and this is the experience of most of us, yet it

only requires steady practical thought to solve any problem that is presented to better ourselves.

It occcured to me it might be interesting and possibly instructive to present a few cuts of some of the practical coal and ash cars, etc., that find favor in certain parts of the country. These represented here are manufactured by the Link-Belt Engineering Co. They might not be called beautiful in architecture yet they are strong and practical for the business.

Plate *A* shows a narrow guage turntable which I find to be exceedingly practical. It is always in line for a car, no matter how the table stands, and turns as easily under a two-ton load as you can possibly desire.

On plate *B* is the general boiler house system of the Ruppert Ice Plant in New York.

In the city, conditions for a modern steam plant are materially different from a plant in the country. A square foot of space is of great value and the general arrangements require that every foot shall be utilized.

You see in this plant that the coal is all dropped straight from the cars, on the street siding, into the crusher and from there the traveling buckets take it to the top of the house.

When once landed in the bins it is not touched again by hand, but is discharged into the furnace magazines by simply pulling a chain on the boiler floor. The accumulated ash, however, is conveyed at night by the same bucket elevator from large hoppers under each furnace to another bin at the top of the house, and this in turn is not moved again till a lever is pulled below, and it is discharged into a car or cart on the street.

When Mr. RUPPERT provided this apparatus, he expected to spout all his ashes into open cars for the railway company to run off, but when contractors in the city found that all the ash from the Murphy furnaces was ground up to about the grade of coarse sand, they agreed to cart it all away for him and pay for the privilege.

The installation of a system like this is expensive, but it makes possible the locating of a plant within the city and caus-

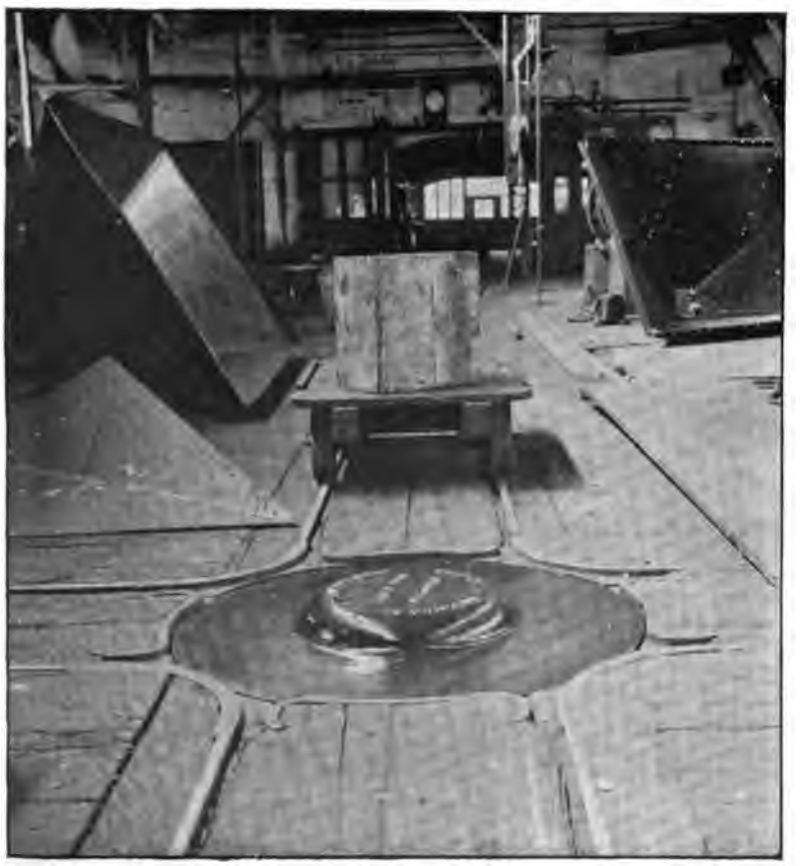


PLATE A.
BUILT BY THE LINK-BELT ENGINEERING COMPANY.

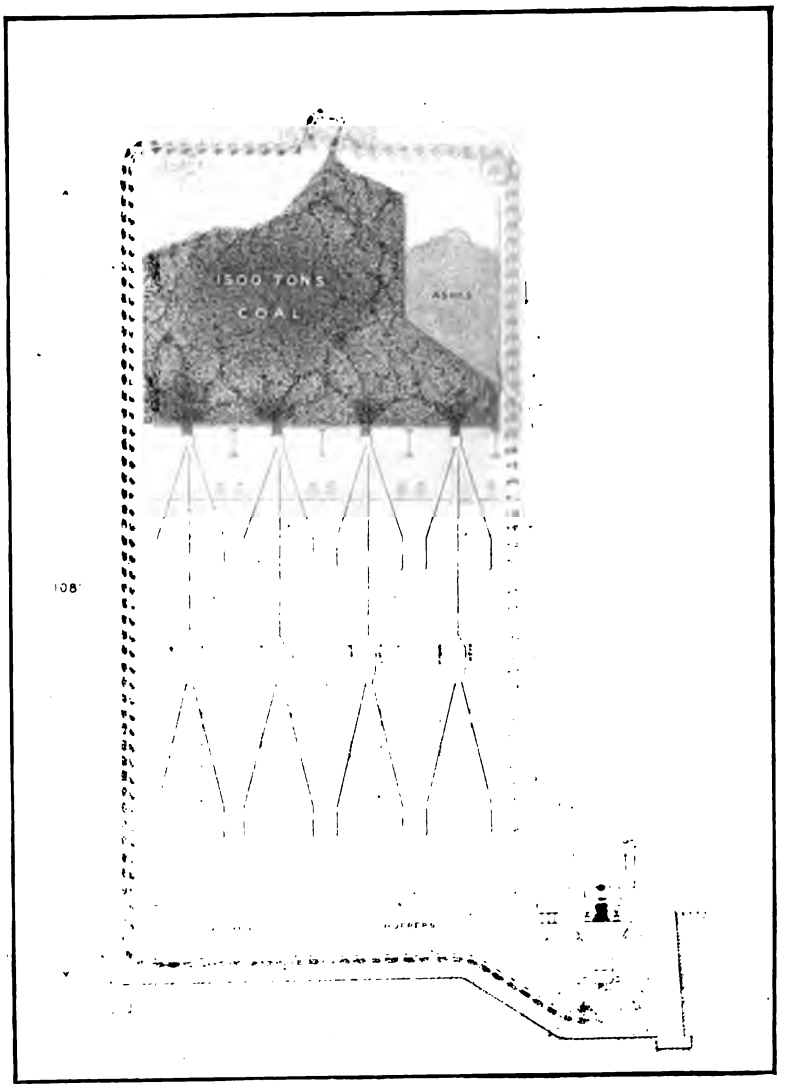


PLATE B.

BUILT BY THE LINK-BELT ENGINEERING COMPANY.

BUILT BY THE LINK-BELT ENGINEERING COMPANY.

BUILT BY THE LINK-BELT ENGINEERING COMPANY.

ing no discomfort or annoyance to any one, our contract for furnaces guaranteeing to produce no more smoke from bituminous coal than with anthracite.

There are more people who can talk intelligently on the subject of the handling and storing of coal than of ashes. It has been a matter of comment with me for several years, noticing, as I do, the crude and inadequate provision for the handling of ashes, made by a great many architects in laying out their steam plants for our large office buildings, and yet here is a matter of as much and in many cases of more consequences than the coal question, and it is more difficult to cope with. This arises largely from two causes: first, its dirty, dusty character, and second, because of its being but a small percentage of the coal bulk, it is generally left to take care of itself, and finally results in a make-shift apparatus to handle it, and to be ever after a source of annoyance and expense to the man who must operate it.

In a degree this comment is applicable to the general mill plant. You make provision to handle coal in one way or another and leave the ashes to collect in a pit till in some cases they get so high as to burn your grates out, after which you are forced to take time for a general wetting down and dragging out, to the demoralization of the whole boiler room, especially if you are running twenty-four hours to the day and your fire room is a narrow one.

The handling of ash with any kind of conveyor is not particularly satisfactory, because of the corrosive effect of this material. Still, it can be done, and is done in certain places, with very little to complain of.

I think, however, the best plans I have worked out or have seen in operation, are obtained by the ash tunnel and dump car system. Particularly is this the case if your car can finally emerge from the tunnel on an embankment or elevation. If that is not possible, a good plain hydraulic lift located midway between a long battery of boilers will accomplish the desired result.

Now, with this combination you have very little machinery, and what there is, will give the minimum amount of trouble and expense. Furthermore, if the hydraulic lift is employed you can take your ashes up to a considerable height for but a trifle more expense, and thus very possibly run your car off to a point not otherwise accessible for dumping.

Continuing this line of thought concerning the application of the hydraulic lift, let me suggest to you how simple it is to employ this same lift to take a thousand pound dumping coal car from some low level, say, perhaps, only from the boiler house floor and elevate it to a track directly over the furnaces, and by providing the lifting platform with an anti-friction turntable you can run your coal either way and dump directly into the furnace magazines, using a side dump or bottom dump car for the purpose.

An arrangement of this description will enable you to feed your long line of furnaces, and to run out your ash with a minimum amount of labor and expense, and to a degree of satisfaction in all respects that your present old hand system cannot be compared with.

This reducing of the labor account recalls a little story of the mill superintendent and the Irish fireman.

The superintendent was calculating one day, how he could best arrange to fire his ten boilers with one fireman instead of five, which of course meant that four men must be discharged. Pat, walking up to him, said: "Well, Mr. Superintendent, we hear you are arranging to decrease your force and four of us poor devils will have to go." "Yes," says the Superintendent, "that's what it will result in. I now pay you five men $1.75 for an eight hour watch; that is $8.75 on every watch. As business is so rushing we must run the 24 hours, which means $26.25 per day, and when I endeavored a few weeks ago, to get you fellows to run a twelve hour watch for $2.00, you said you would strike first. Now, some new furnaces are to be put in and four men on a watch must go, although doubtless I shall pay $2.00 where I now pay $1.75, because the men will be

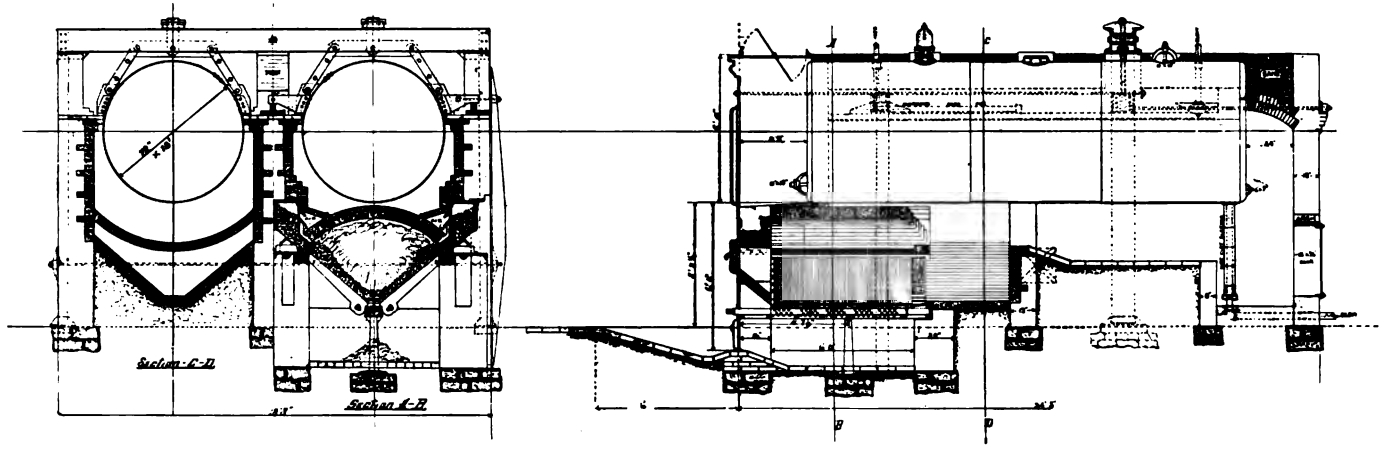
— WOOLSON'S —

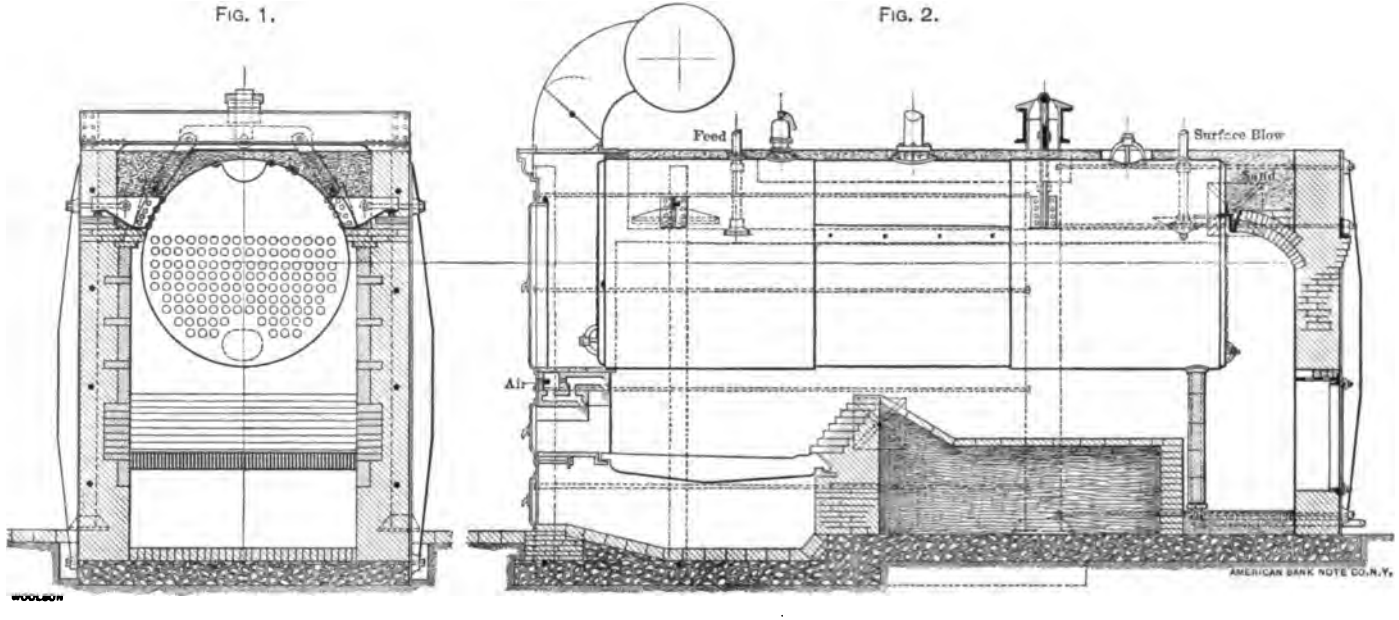
IMPROVED BOILER SETTING

Murphy Automatic Stokers

Havemeyer Building

N. Y. City.





WOOLSON BOILER SETTING — FLAT GRATE.

WOOLSON
A
A'
C
C'
D'
D
E
Section through centre
6 Inches.
AMERICAN BANK NOTE CO., N.Y.

furnace tenders and not mere shovelers of coal." Pat stood and scratched his head for a moment. "Well, Mr. Superintendent," he said, "you are going to do this, are you?" "Yes, Pat, I shall try hard to do it." "Well," said Pat, "then, be jabers, I'll help you."

On pages 231-232, I have shown two cuts of horizontal fire tube boilers in what is known as the Woolson system of suspension and setting; one cut shows the boilers installed with Murphy furnaces, while the other has a flat grate; each boiler, however, is suspended from three points only. The rear point, which becomes the swinging point, is so located that its gallows frame shall carry two-thirds of the entire weight, leaving but one-third to be carried upon the brickwork at the forward end, and that one-third is entirely off any fire-brick lining, except in very large boilers it may be found wise to provide a forward gallows frame also to relieve the walls from excessive duty.

This manner of setting boilers is pecular to myself, and has potency in the subject of my paper in that this system of hanging boilers will materially reduce the maintenance account of a boiler plant.

Twenty-five years' experience teaches me that the brickwork around a boiler has a legitimate function to perform, and to be weighted with tons of iron and water is altogether wrong and is not a legitimate duty for the brickwork to perform.

Some years ago I prepared and read a paper on this subject before the Society of Mechanical Engineers, and am pleased to note that it has found favor in many quarters, east and west, a flattering expression reaching me only recently from one of your foremost firms of mill engineers in this town of Boston, they having adopted this system of suspension for a number of horizontal fire tube boilers 90 inches diameter and 20 feet long which are the largest boilers of this class ever built for high pressure; I refer to Messrs. Dean & Main.

On page 233, I show several boiler accessories, which are peculiar to myself, and as they are not patented, anyone can adopt them if they see fit.

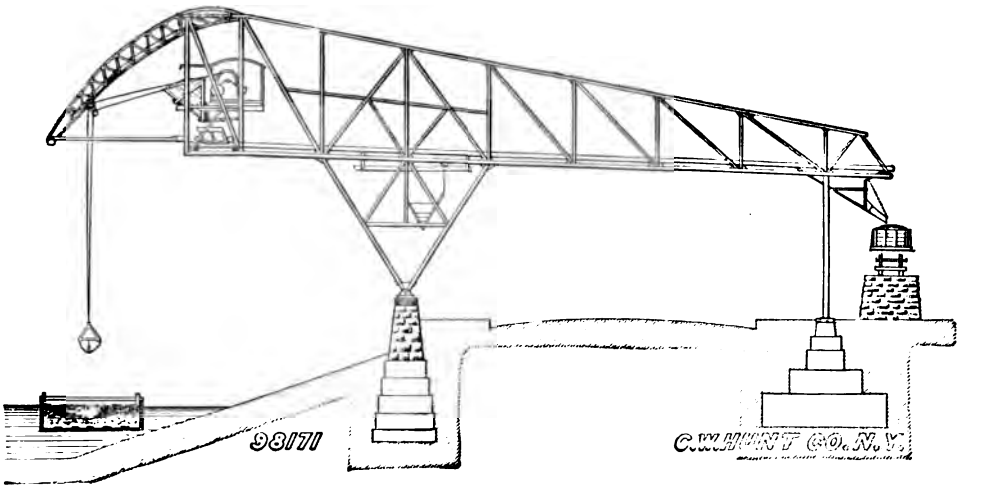
I can only say that they are the result of many years of practice. Still, if you have ideas that you think are better, then do not entertain mine, but first be sure you have an improvement, otherwise the time may come when an accounting of your stewardship may be called for.

My system of fire door arches I will not attempt to describe in this paper. I may say this, however, that experience shows that in this comparatively small part of any furnace setting, there is usually lots of annoyance and lots of money spent to keep the fire arches in repair. Especially is it so if you are running hard and continuously; and if you do not keep them up, away goes your boiler front and away flies economy in more ways than one, particularly if holes get eaten through your furnace into the forward uptake.

My attention was called to this matter of fire door arches in a very forcible way in August last. I had been consulted by one of our large refrigerating machine manufacturers, which led to some correspondence with the Andover Iron Company, for whom I had put in arches in 1893, and to my surprise the same arches are in place today, and according to their statement they had not, up to that time, spent a cent in repairs. This statement had greater significance to me than to any one else, for I knew how very wide the arches were, and with what little spring it was necessary to make them by reason of the character of the old setting, and furthermore, that they had been unable, up to 1893, to keep an arch, built in the ordinary way, in place longer than six months at a time, and it had become a fixed charge against these boilers to renew the arches twice a year.

Another expensive feature of all ordinary boiler settings is the cracking and leaking of the back walls. Figure *A* on page 233 of accessories is designed to stop all that. Another feature is the leaking around the cleaning-out doors at the sides or back of the brick setting. Door and frame marked *C* on page 233 of accessories will stop all that.

Take a walk around your boiler and look at those insignifi-



No. 98153.

PLATE C.

cant cleaning doors, and possibly, if your firemen, and particularly your engineer, is a watchful man you may find fire clay or asbestos paste, or mud if nothing else is available, plastered all around these doors. Or, perhaps you will find the door to be reasonably close fit, and it does not seem as if it were necessary to plaster it over, but light a match and place it to the edge, and if you have the proper draught to your stack you will see how quickly the match is sucked out.

Now, every cubic inch of air that gets through cracks in walls or through cracks around doors, means that you have got a fixed charge against that boiler which you should not have, for it is not legitimate.

Some engineers pay dollars for bricks to make an indifferent protection around the blow-off, or perchance will spend dollars to put an iron sleeve over this pipe resulting in another fixed repair charge. I do not; but instead use refractory clay sleeves that can be had for less money and when once on will last as long as the boiler.

Cut 98,171 is an interesting design of an automatic railway and coal elevator for a long reach, built by the C. W. Hunt Co.

Cut 98,153 is a half-tone picture of one of our latest sugar refineries also fitted up by the Hunt Co. The elevator buckets convey only coal to the bins at the top of the house, other provision being made to dispose of the ash, boilers in this building being installed in two tiers the same as the Ruppert Ice Plant.

The half-tone picture plate *C* shows on the left a long line of boilers fitted with Murphy automatic furnaces, each magazine being supplied with coal from the auxiliary hopper above by a chute. Each chute has a valve, or cut-off, located at its upper end and operated by a long suspended rod.

This auxiliary hopper above is supplied with coal by a traveling electric elevator seen on the right. This elevator takes its coal from a boot which is fed at successive points from the long bin directly behind it.

This arrangement affords the storage of a large quantity of

coal at a low level, and only being elevated as required for the furnaces.

The ash from these furnaces is conveyed away from below, and as you see the fire room floor here you will see it always.

Two men to tend the magazines and another to run the elevator are sufficient except with a poor quality of coal, and then it requires another man to tend the furnaces, due particularly to the sluggishness or sifting of the coal through the bars.

With a flat grate furnace it would take eight men at the fires, but we will assume the same man is at the elevator, the coal in that case being spouted on to the floor directly in front of each fire. In either of these cases there would be a foreman, who becomes the water tender.

These furnaces are all piped up to take the exhaust steam from the stoking engine and discharge it under the grates. No blower or steam blast is required, simply a good natural draft.

My purpose has been to lay before you in a logical manner certain features of a steam plant that if investigated and taken advantage of will afford much relief and satisfaction in the every day business of the steam end of the mill, and will certainly result in greater economy and a betterment of the whole plant.

The PRESIDENT. Are there any remarks, gentlemen, concerning this paper? The next subject in order is Water Cooling Towers and Positive Steam and Oil Separating. I have pleasure in presenting to you Mr. FRANCIS H. BOYER. [Applause.]

Mr. FRANCIS H. BOYER. Mr. President and gentlemen, it was left for a German investigator in Berlin to first make use of this principle of cooling water by air. I do not know whether he received his lesson from that which was taught us by our mothers when they gave us a hot cup of tea and we poured it into the saucer and raised it to our mouth and blew the air over it to cool it, a few blasts of air bringing it to the temperature at which we could drink it. Later on in life, when we were surrounded by cares and luxuries and had become dyspeptic, and were advised by our physician to take a bowl of hot water and drink it boiling hot, we placed it to our lips just as it came from the tea-kettle, boiling, and we drew in the air rapidly until by the vaporization of particles of water from the surface the boiling water would quickly come to a point at which we could drink it without injury. Now this German experimenter built a room in which he put shelves about a foot apart and bored holes in them and nailed brushes in the holes. The air in entering that room would pass from one shelf to another, back and forth and back and forth, and finally discharge at the top. That seemed all right in theory, but engineers who have had experience in handling air find that it is difficult to force air in great quantities when you impede its passage.

WATER COOLING TOWERS AND POSITIVE STEAM AND OIL SEPARATING.

FRANCIS H. BOYER, Member of American Society of Mechanical Engineers, Somerville, Mass.

In looking over the questions asked at the closing sessions of your last meeting, I find that the matter of economy in water saving is one which has become sufficiently prominent to attract your attention, therefore, I feel considerably favored at this time to be able to present to you my paper answering the questions, and saying that we are able to reclaim water from exhaust steam in almost an absolute condition of purity, and to positively remove the oil used in the lubrication of the steam cylinders to enable the water to be used indefinitely in a cycle of heat transmission from the steam boilers to the engine and return, with a loss only from the vaporization to the atmosphere while exposed; also, that lost from leaky pump piston rods, or other leaks where steam is used. These losses amount approximately to about 6 per cent. of the entire amount of water in the cycle daily.

The positive oil separator must be constructed in size and area sufficient to accommodate the horse power of the engine, one or more, which are exhausting through it. In the construction of "positive" separators, where the engines are working condensing, the cylinders holding the oil-catching material must be of sufficient strength to prevent collapsing under a vacuum of as high power as can be obtained, or nearly an absolute vacuum of $14\frac{7}{10}$ pounds.

By following the cycle of water travel, we will start at the entrance of steam to the engine cylinder, where by virtue of the heat it carries, it does the work of driving the engine; in passing through the steam cylinder, it takes the oil used in lubrication on the walls and surface of the cylinder. Our engine is an ideal one in construction, and we find the exhaust leaving the cylinder at a pressure equalling from 22 to 25 inches vacuum, and with an approximate temperature of 150 degrees F. The steam now passes through the positive coke filter, where by virtue of the surface exposed, the oil is deposited to a thickness not to exceed 1-32 of an inch. The steam entering at the bottom rises through the coke, and this process of deposit continues until all the mass of filling is coated, when it has to be removed and a clean substance takes its place.

These positive oil separators are built either of boiler or of cast iron, and they must have the strength to withstand the atmospheric pressure due to there being a vacuum on the interior. In size they vary from two to six feet in diameter, and from six to sixteen feet in length.

By using the term "coke," we do not mean that coke is essentially necessary, for any substance which exposes a surface will intercept the oil. The writer has used broken brick, also blue stone spalls, in separating the oil from steam with equally as good a result. By using coke or wood blocks the mass can be burned under the boilers, becoming valuable fuel, and at the same time dispose of a large quanity of oily refuse.

We find the steam leaving the top of the oil separator free from oil. From this point the steam enters the condenser, either jet or surface. We will consider the jet or pump condenser, which is preferable to use, for the reason that it is less expensive in construction. After the steam is condensed, the pump delivers the water into a hot well at a temperature varying from 100 to 125 degrees. In this hot well both the condensed steam, also the condensing water, are delivered, and from here the feed from the boiler is taken; the water returning to the boiler, completes this part of the cycle.

From the hot well, an auxiliary pump takes the water and passes it through the water tower, where it is exposed in a thin film to a blast of air in which vaporization takes place, and the rapid cooling of the water is accomplished, the water falling into a cold well from where it can be drawn up by the air pump used in condensing the steam.

Care must be taken in designing a water cooling and recovering plant that the usual discharge from the exhaust mains are drawn off by gravity and taken away by an air pump, and for this reason it is impossible to make a cast iron rule to answer to every installation, but each must be taken up individually and its details worked out.

In the design of water cooling towers we find a varied condition, some using simply a surface to permit the water to come in contact with the air, and others by permitting the water to flow through space. These do the work very well when the humidity is very low, but when the density of moisture increases in the atmosphere they fail to do their work, and the result is an intermittant action not at all desirable for service requiring the continual operation of an engine.

By building water cooling towers with a positive fan delivery of the air where the quantity can be increased or diminished by changing of the speed of the engine, we are able at all times to positively control the temperature of the water falling to the cold well from the cooling tower.

In results, we are able at all times to bring the temperature of the water to from 70 to 80 degrees, and at times the water will fall from 12 to 20 degrees below the temperature of the atmosphere.

In operating, some of the best results are obtained when the weather is warm. On an engine developing $643\frac{3}{10}$ horse power on August 2nd, 1898, the water going to the tower was at a temperature of 128 degrees; it returned to the cold well at 91 degrees. The condenser maintained a vacuum of 26 inches, engines operating with a steam pressure of 120 pounds per square inch. The horse power required to drive the air pump

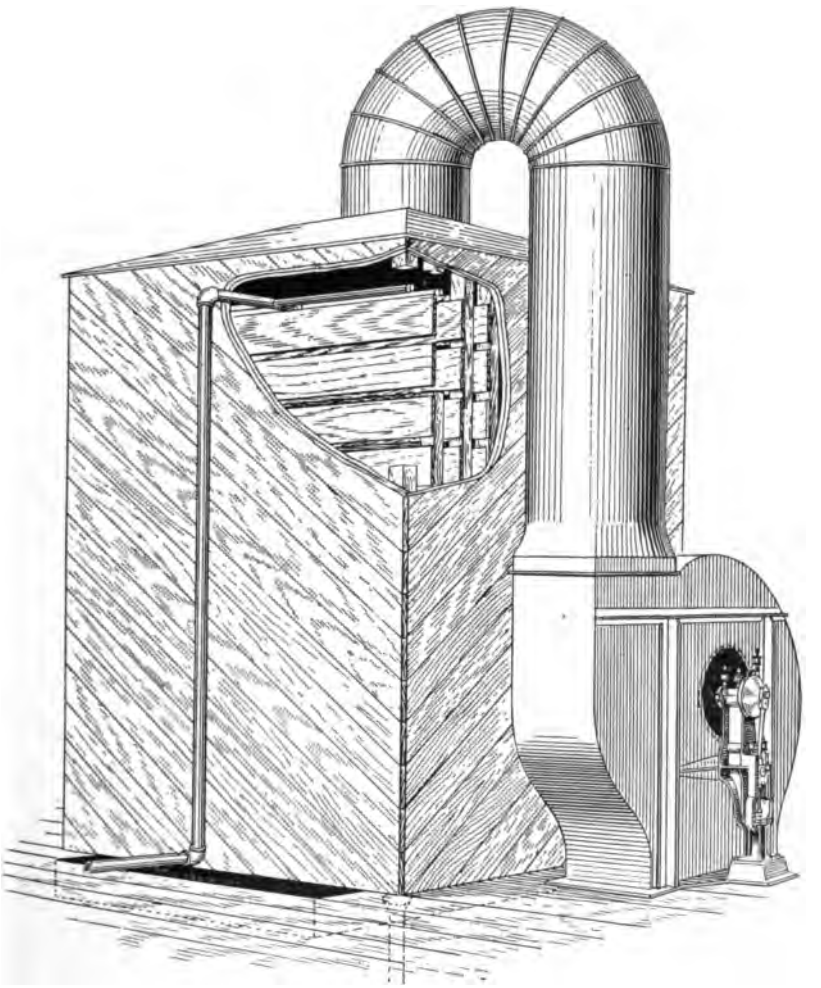


FIGURE 1.

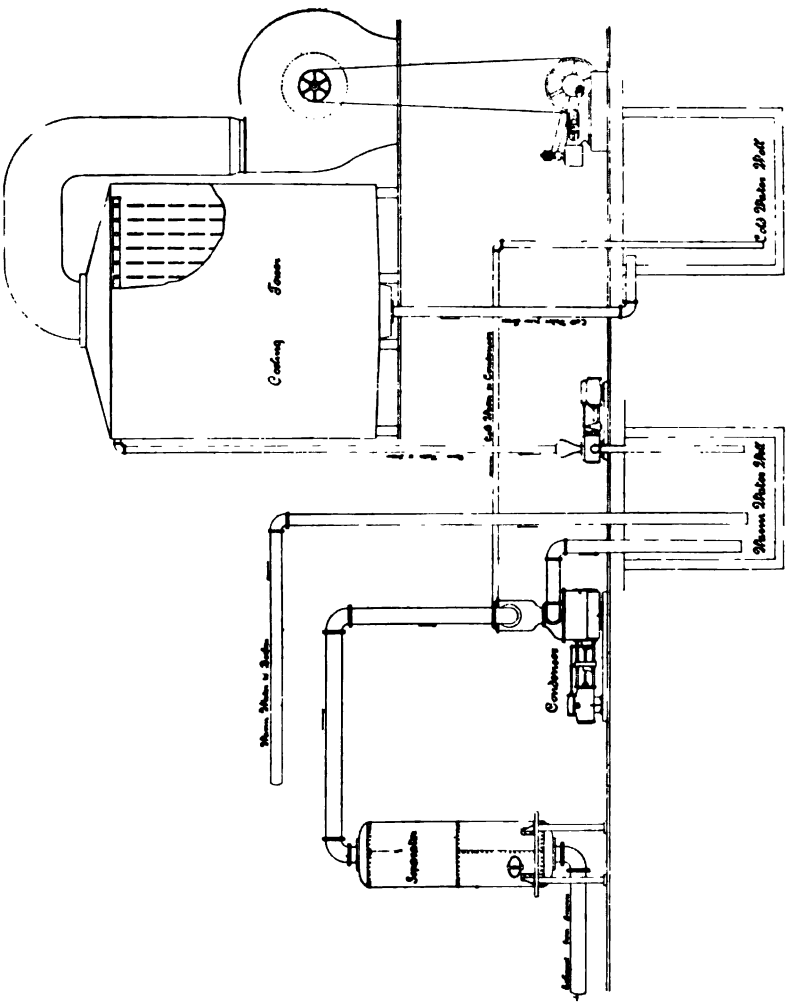


FIGURE 2.

was $13\frac{75}{100}$, and for the water tower $13\frac{5}{10}$. The following figures are selected from many in the writer's possession, taken from actual work, and give a comprehensive condition of results.

No. 1

Initial temperature of water to cooling tower,	100 degrees.
Final " " from " "	71 "
Heat extracted,	29 "

Atmospheric temperature, 95 degress.
" humidity, 37 per cent.

No. 2.

Initial temperature of water to cooling tower,	160 degrees.
Final " " from " "	81 "
Heat extracted,	79 "

Atmospheric temperature, 95 degrees.
Humidity, 44 per cent.

No. 3.

January 31st, 1890.

Initial temperature of water to cooling tower,	110 degrees.
Final " " from " "	65 "
Heat extracted,	45 "

Atmospheric temperature, 30 degrees.
Engine vacuum, 25½ inches.

No. 4.

July 26th, 1890.

Inital temperature of water to cooling tower,	120 degrees.
Final " " from " "	84 "
Heat extracted,	36 "

Atmospheric temperature, 96 degrees.
Engine vacuum, 24½ inches.

Observation. Nos. 3 and 4 were on the same engine plant with conditions unaltered.

The value of a water cooling and cleansing device is shown on a plant where there is a scarcity of water, and the engine is exhausting to the atmosphere, or what is known as working high pressure.

We will take an imaginary plant of this description of 500 horse power, consuming 28 pounds of water per hour per horse power, and working 300 days each year of 10 hours each day, and we have the following result:

500 horse power x 300 days x 10 hours x 28 pounds water = water vaporized 42,000,000 pounds and evaporating 10 pounds water by consuming 1 pound of coal, we have 4,200,000 pounds of coal equalling 2,100 short tons at $3.50 per ton = $7,350.00.

42,000,000 pounds water equals 5,060,000 gallons at 12 cents per thousand gallons equals $607.20.

Cost of coal,	$7,350 00
Cost of water,	607 20
Total cost of operation,	$7,957 20

By introducing a water purifying and cooling plant, also a condensing pump, and placing the engine under vacuum or low pressure we find the following results:

The engine should be able to run on 21 pounds of water per horse power per hour.

500 horse power x 300 days x 10 hours each at 21 pounds of water equals 31,500,000 pounds of water and evaporating 10 pounds of water by consuming 1 pound of coal, we have 3,150,000 pounds of coal consumed, equalling 1,575 short tons at $3.50 =	$5,512 50
15½ cents daily for water lost in vaporization for 300 days,	46 50
To operate condensing pump and air blower, 29¼ horse power 300 days at 10 hours using 21 pounds of coal equals 85 short tons at $3.50	297 50
240,000 gallons water to operate condensing pump and air engine at 12 cents,	28 80
Total,	$5,885 30

This shows a saving in favor of the condensing, clarifying and cooling installation of $2,071.90.

Investments of this character, when the interest on money invested in the installation is included and becomes part of the operating expenses, will show a return of from 26 to 75 per cent. on amount expended for installation.

The PRESIDENT. Gentlemen, have you any questions to ask Mr. BOYER or any remarks to make?

Mr. GEORGE I. ROCKWOOD. Mr. President, I would like to have discussed the paper, but I am afraid it is a little late, and I will not do it unless some gentleman desires the discussion to go on. I know there are more papers to be read.

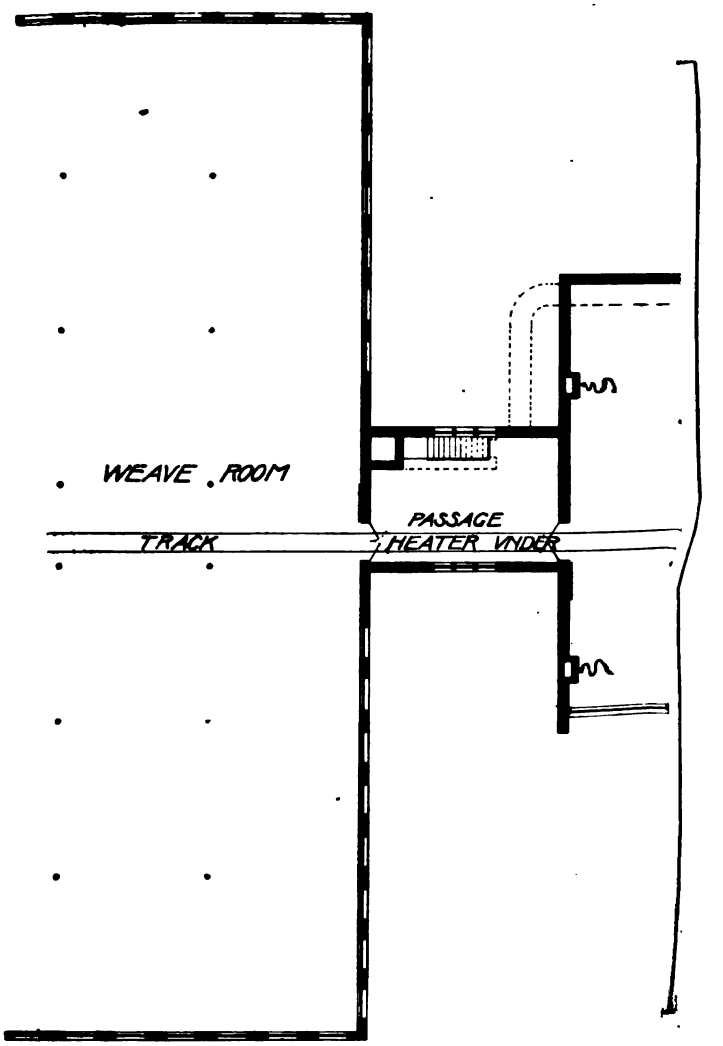
The PRESIDENT. Any remarks that you have to make I think we can listen to for a few minutes, Mr. ROCKWOOD. We shall be glad to hear from you briefly.

Mr. GEORGE I. ROCKWOOD. I should like to ask Mr. BOYER if he has reckoned into the saving which the cooling power is expected to produce the cost of running the auxiliaries. That is to say, there are three auxiliaries in connection with the water cooler: one to run the fan, one to pump the water, and auxiliaries in addition for the condenser. Those, of course, take a certain amount of power, more than three times as much as the engine takes per horse power per hour. And while the condensation will save about 15 per cent. of the total coal consumption, these auxiliaries by themselves take as much as that to run. Of course that can be recovered by the use of a feed water heater, and the question, therefore, would arise whether in a particular plant there was any place to get exhaust steam from other than these auxiliaries. If so, of course, condensing would not pay,

and, on the other hand, if you were successful in recovering all that heat, it might, I think, pay. But the paper deals with a simple condensing or a simple non-condensing engine, and the figures are 21 pounds as compared with 28 pounds for coal consumption per horse power per hour, whereas the average cotton mill engine is a compound engine, dealing with very high boiler pressures, and there is some difference in the conditions.

Mr. FRANCIS H. BOYER. Mr. President, in reply to Mr. ROCKWOOD'S remarks, the expense of operating the several parts was included, and also the expense of placing the exhausts from these auxiliaries into the condenser and condensing the exhaust. In lieu of the feed water heater you will see that the water is discharged first into a hot well — "warm water well" my draughtsman has put it — and that water goes to that hot well hot. It will go there at a temperature of 110 or 112 degrees. Running at 25 inches of vacuum, the temperature would be about 150 degrees — that would be right, wouldn't it, Mr. ROCKWOOD? — about 150 degrees and recovering it back to the boiler at about 112 degrees — and understand, in this hot well this water is pure; it has been cleansed before it gets to that point, so that it does away with the necessity of a feed water heater. The water from that hot well is returned directly to the boiler; then also from that well the water necessary to go through the cooling tower and produce the condensation is also taken and run through the cooling tower, from the cooling tower back into the jet condenser or pump condenser, and from that all discharged again into the hot well, so that virtually there are two cycles going on here. If I remember correctly, Mr. ROCKWOOD, I did take into account the expense of operating these auxiliaries, and I placed the auxiliaries into the condenser and worked them in that way.

The PRESIDENT. Any further remarks? We will proceed to the next subject, a paper upon The Cloth Room: Its Arrangements and Needs, by Mr. ARTHUR F. GRAY of Boston.



ARTHUR F. GRAY. MILL ENGINEER.
BOSTON. MASS.

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THE CLOTH ROOM: ITS ARRANGEMENTS AND NEEDS.

ARTHUR F. GRAY, Mill Engineer, Boston Mass.

Few departments of a textile mill have more to do with the measure of public favor in which its goods are received by the general public than do the cloth finishing, packing and shipping departments.

These are of such vital import to the welfare of the mill and its highest success, that too great importance cannot be attached, even to the minutest details of its construction, arrangement of machinery, and the handling of the goods from the time they leave the looms until they are finally packed and taken to the storage for shipment.

Economical handling of the cloth throughout its passage from the weave shed to the storehouse should be carefully considered. A large proportion of our present mills have too little attention paid to this important feature, and oftentimes we find that the cloth has to be trucked or carted to some point far removed from the place of manufacture.

The cloth room should be carefully designed to accomplish the following results:

1. TO OBTAIN THE GREATEST POSSIBLE IMMUNITY FROM FIRE.

To accomplish this the building containing finishing and packing rooms should be fully detached from the weave shed and storehouse, but occupying a position between them, and having its floors on a common level, to afford easy access for cloth trucks or cars, and at a height above ground to admit of

loading the goods to cars without lifting them. Connecting passage-ways about thirty feet in length should connect with the weave shed on one hand and the storehouse on the other; these should have fire-proof floors, walls, and roofs, and be lighted only by small windows and have their entrances protected by double fire doors of standard construction. The cloth inspecting and finishing rooms, and cloth storage and packing rooms, would be best separated by a fire wall with suitable buttresses and parapet between, provided also with fire doors for communication.

The rooms should have sprinkler equipment, and a convenient system of fire hydrants provided, contiguous to the building.

2. DISPOSITION OF HEATING APPARATUS.

The heating should be furnished by a fan and coil system. The apparatus would be best located below one of the passage-ways, in a fire-proof room, the horizontal ducts carried below floor and connected by uptakes in the southerly or other blind walls, and introduced near the ceiling through properly arranged openings controlled by regulating dampers.

The air supply for the coil and fan should be taken from a large vertical duct or shaft, to avoid an excess of dust, and drawn down from above to the settling chambers, and then passed through a washing coil to remove the remaining dust, before passing to the heating coils proper. This would ensure a clean, fresh air supply.

3. TO OBTAIN THE BEST LIGHT FOR THE INSPECTING OF GOODS.

The building should be erected either directly east or west of the weave shed, and should have a saw tooth roof, its light being taken from the north side only; this roof light being supplemented by tall windows on north wall extending from a point four feet above floor to the plate; all windows being immovable, and glazed with ribbed or cast glass, and controlled by proper shades to exclude sun when required.

Necessary ventilation should be provided by a system of up-

take ducts, relying entirely upon the air supply furnished by the fan system, both in summer and winter.

The interior walls of the cloth room proper should be finished in white enameled brick, with molded base of the type used in hospital wards. The use of enameled bricks would give a permanent wall surface easily kept clean requiring no repairs, and perfectly vermin proof, while furnishing the lightest interior for the room.

The cloth room floor should be adequately supported, and should have a well ventilated space or low story under it. It should be constructed of heavy matched Southern pine plank; a layer of specially prepared fire retarding paper, over which either a closely laid matched rock maple floor, or a ⅞ inch rock asphalt floor, should be laid; preferably the latter.

With such a room, and its machinery arrangements made in a manner to give proper space for the handling of the goods, and so arranged that the least possible handling would be required in the inspecting, shearing, brushing, sewing, winding, calendering, and other kindred processes, excellent work could be attained.

These machines should be placed so that the light afforded will be the best for the detection of the imperfections in the cloth, as the perfection of the fabric and its cleanliness and neatness have full more to do with its satisfactory marketing than the manner of its fabrication or its prior manipulations throughout the various processes which it has to travel, between the crude fibre and the finished product. Yet we would not minimize in any sense the degree of care which should attend all the prior operations, as eternal vigilance in all departments of the mill is essential to the most complete and thorough success.

Cleanliness should prevail everywhere, and it is suggested that the power be applied to the machines from electrically driven shafts below the floor, in case of the smaller machines, or by direct connected motors, wherever feasible, as minimizing the losses of power, excessive use of belting, and distribution of dust as far as possible.

The hard, clean finish of the room will greatly facilitate the furtherance of the prime object, namely, the production of clean and perfect goods.

It would also seem desirable to remove as much of the dust from shearing, brushing, singeing, or allied machines, as could be done by a system of exhaust ducts and powerful exhausters connected with the machines performing these operations.

The woven goods should be transported from the weave shed to the cloth room; from the cloth room to the packing room; and thence to the storehouse, by a system of light cars with proper tracks, by an overhead system of conveyers, or by light trucks, any of which systems could be easily and satisfactorily installed and operated with economy.

The cloth inspecting machines should be placed endwise to the north wall where the best light for the work is to be had; and the sewing, brushing, shearing, singeing, folding and measuring machinery could be arranged to enable the operators to obtain distinct and strong lighting upon the running work, thus rendering inspection during these processes both thorough and perfect. The machinery could be placed so as to allow the work to pass through the processes in consecutive order, and without unnecessary or expensive handling.

The cloth room equipment for standard sheeting or print cloth mill on brown goods, making, say, 50,000 to 75,000 yards per week, should be as follows:

5 Inspecting Machines with Brushing Attachments.

3 Railway Sewing and Rolling Machines.

3 Combined Brushing and Shearing Machines, with Calender Rolling Attachment and Steam Vapor Cylinder.

3 Improved Cloth Folding and Measuring Machines.

1 Power Cloth Press, located in the Packing Room.

The packing room should also be provided with platforms slightly raised above the floor, to protect the bottoms of piles from dirt and dampness. On these platforms the goods can be stored after pressing and prior to marking, ticketing, and invoicing, or when desirable, to keep them in stock.

Several large tables should be provided for use in wrapping of the pieces before packing. The goods after casing and marking should be immediately removed to the storehouse, there to await shipping orders.

Should the mill be run upon fancy colored goods, as denims, ginghams, plaids, or other like products, the finishing machinery lines would be more extensive, and would involve a different arrangement; while the stock and packing rooms would require more spacious treatments, as the making up of colors and styles requires larger facilities for stocking than where brown goods only are involved.

No less important in consideration should be the selection of a proper overseer for the cloth room and its dependencies. Such a man should be a person of skill and taste, thoroughly awake, and alert in grasping the needs of the prospective buyer, and capable of presenting the products of the mill in such form, dress and uniformity, that once seen they must perforce be appreciated.

By strict attention to these details, such a mill would have a great advantage over its competitors, and its goods become important factors in the trade, owing to their perfection and attractive make up.

NOTE. — The sketches presented herewith embody in a general way the suggestions made in this paper, and show the equipment required for a standard sheeting mill as suggested above.

FOURTH SESSION.

THURSDAY AFTERNOON, APRIL 25, 1901.

The Association met in Chipman Hall at 2 P. M., President THOMPSON in the chair.

The PRESIDENT. Gentlemen, I will ask you to come to order and give your attention to the remaining matters on the programme. We have before us an excursion this afternoon which will be of great interest, and it will be desirable to proceed as speadily as possible with the programme.

The first paper is the Report of the International Congress for the Unification of the Numbering of Yarn, which will be read by the Secretary, who has translated it for this Association.

REPORT OF THE INTERNATIONAL CONGRESS FOR THE UNIFICATION OF THE NUMBERING OF YARN,

Held at the International Exposition, Paris, September 3-4, 1900.

BY

MONSIEUR FERDINAND ROY,
Recording Secretary of the Congress.

Translated by Mr. C. J. H. Woodbury.

The following was the committee of organization.

President.

ÉMILE WIDMER, Vice-President of the French Association of Manufacture and Agriculture, member of the Commission on Custom House values at Paris.

[NOTE. At the meeting of the Association, held at Montreal on October 6th, 1899, the following resolutions submitted by a committee consisting of Messrs. NATHANIEL B. KERR, ARTHUR H. LOWE and CHRISTOPHER P. BROOKS, were adopted. (Volume 67, Page 92.)

Resolved, That the New England Cotton Manufacturers' Association learns with interest that a conference is to be held in Paris in 1900 with a view to the unification of yarn numbering.

Resolved, That the object of the conference is heartily approved, and that this Association recommends the adoption of a single standard to indicate yarns and threads of all materials, more especially those made of cotton.

Resolved, That the President and Secretary of this Association be authorized to communicate these resolutions to the Secretary of the Conference.]

Vice-Presidents.

D. CHEDVILLE, President of the Association of Woolen Spinners of the Seine-Inférieure, of l'Eure and of Calvados at Saint-Pierre-lez-Elbeuf.

FERDINAND ROY, Vice-President of the Association of Cloths and Textile Materials at Paris.

Secretaries.

PAUL FLEURY, Engineer and Manager of the Counting House of Linen Manufacture at Paris.

J. PERSOZ, Director of the Value of Silks and Woolens at the Chamber of Commerce at Paris.

ÉDOUARD SIMON, Civil Engineer, Paris.

ABBE VASSART, Director of the Technical Institution of Roubaix.

Members.

AGACHE, President of the Industrial Society of Lille.

ANGELOT, Member of the Chamber of Commerce of Paris.

AYNARD, Vice-President of the Chamber of Deputies, Honorary President of the Chamber of Commerce of Lyons.

BARAT, Secretary of the General Association of Cloths and Textile Materials.

BESSELIÉVRE, President of the Industrial Society of Rouen.

BIPPER, Director of the Value of Silks, Cottons and Woolens at Roubaix.

BONTE, Director of the Value of Textile Materials at Tourcoing.

CARMICHAEL, Jute Spinner.

CORDONNIER, President of the Industrial Society at Roubaix.

FOUGEIROL, Senator.

GEORGEOT, Editor of the *Travail national.*

HÉNON, President of the Association of Manufacturers of Laces and Tulle at Calais.

HUOT, Member of the Chamber of Commerce of Paris.

IMBS, Professor of the National Conservatory of Arts and Measures.

ISAAC, President of the Chamber of Commerce of Lyon.

LAMY, President of the Industrial Society of Amiens.

LEGROS, President of the Woolen Society of Fourmies.

MARTEAU, President of the Industrial Society of Reims.

NIVERT, President of the Industrial Society of Elbeuf.

PETERS, Councillor of Foreign Commerce at Épinal.
SÉBASTIEN, President of the Industrial Society of Saint-Quentin.
SIMONNOT-GODARD, President of the Association of Cambric and Fine Linen.
TEISSIER DU CROS, Spinner of Raw Silk.
TERNYNCK, Manufacturer at Roubaix.
TESTENOIRE, Director of the Value of Silks at Lyon.
TOURON, Member of the Chamber of Commerce of Saint-Quentin.

OFFICIAL DELEGATES OF THE FRENCH AND FOREIGN GOVERNMENTS.

Germany.

MÜLLER, Councillor of the Imperial Office of the Interior at Berlin.
VOGEL, Councillor of Commerce at Chemnitz.

Austria.

DE PACHER, Ex-Deputy, Councillor of Imperial Commerce, President of the four preceding Congresses.
Chevalier MITSCHA DE MAERHIM, LL. D., Director to the Royal Minister of Commerce.

Belgium.

CH. MÜLLENDORF, Honorary President of the Chamber of Commerce of Verviers.
L. ZURSTRASSEN, Engineer at Verviers.
E. MATHUS, Inspector of Mills to the Minister of Manufactures and Labor.

Spain.

RAPHAEL PUIG Y VALLS, Director of the Section of Manufactures at the Exposition of 1900.

United States.

ALBERT LIGON, Engineer, former Mechanical Director of the New York Silk Conditioning Works.

France.

COUSIN, Assistant Director to the Minister of Commerce.
BRETON, Assistant Director to the Minister of Manufactures.
JASSERON, Assistant Superintendent of Military of the First Class.

Great Britain.

AUSTIN C. B. LEE, Secretary of the Embassy.
H. M. BRIGSTOCKE, Colleague Delegate.

Hungary.

Dr. LOUIS BALLAI, Councillor of the Section to the Royal Hungarian Minister at Budapest.

Italy.

ERNEST DE ANGELIS, Senator, Commander of the Crown of Italy.
ATTILIO LENTICCHIA, Professor of Industrial Schools.
Baron COSTANZO CANTONI, President of the Italian Cotton Association.

Japan.

IMANISHI, Engineer of the Silk Laboratory at Yokohama.

Luxemburg.

VICTOR CONROT, Director of the Luxemburg Cloth Manufacturing Works at Pulfermulh.

Mexico.

A. BEC, Engineer.
J. LÈBRE, Engineer.
JOSÉ C. SEGURA, Agricultural Engineer, Director of the School of Mexico.
ALFREDO BABLOT, Receiver of Customs at Mexico.

Russia.

PROF. KOPOSSOF, of the Technical Committee of Finance.
NEDYKHLAEFF, Chief of the Russian Section at the Exposition of 1900.
Prof. GENECHINE, of the Institute of Technology at St. Petersburg.

Sweden and Norway.

BLOMBERGH, Manufacturer.

Switzerland.

CARL SIEGFRIED, Director of the Value of Silks at Zurich.
RIÉTER-FENNER of Winterthur.

Turkey.

GRÉGOIRE HUMRUZ, Consulting Engineer of the Port of Salonique.

Number of French associates,	245
Number of foreign associates,	106
Total number of associates to Congress,	351

Votes proposed to the Sections by the Commission of Organization. The Commission of Organization gave notice:

1. That the resolutions adopted in the former Congresses ought to be approved without renewed discussion and that the records of the present Congress ought to be limited to putting the resolutions into practice.

2. That the Congress should request the Minister of Commerce and Manufactures of France to decree as the legal number for cotton yarn the number of metres to the gramme according to the notice authorized by the Chambers of Commerce consulted by the Commission of Organization of the Congress. And that the laws endorsed by the decree of 1810 ought to be re-enacted in the new decree.

3. That the Congress should request the meeting of a diplomatic conference, in order to reach an international understanding.

4. That after the issuance of the laws and decrees made by the action of the diplomatic conference, the importation of foreign yarns wound in a form deemed illegal should be forbidden in the countries which will adopt the new system.

5. That the Congress should name a permanent international Commission for the purpose of executing the work of the Congress.

6. *That the Congress should vote to send the following address to the Association of the Chambers of Commerce to be transmitted to all the Chambers of Commerce which met in London last June.

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*See page 277.

OPENING SESSION, SEPTEMBER 3, 1900.

President JEAN COUSIN, Assistant Director of Commerce to the Minister of Commerce and Manufacture, in the chair.

The formal opening of the Congress was held in the palace of Congresses at the Universal Exposition, Sept. 3, 1900, at 10 A. M., Monsieur JEAN COUSIN in the Chair.

Monsieur WIDMER, President of the Commission of Organization of the Congress, thanked Monsieur JEAN COUSIN, Assistant Director of Commerce to the Minister of Commerce and Manufacture, representing the minister who had accepted the honorary presidency of the Congress.

Monsieur COUSIN thanked Monsieur WIDMER for his cordial words. He explained that the Minister of Commerce being absent from Paris, found it impossible to fulfil the duties of President which he had accepted, and that he was charged to bring the expression of the deepest sympathy of the Minister for the work of the Congress.

He welcomed the official delegates of foreign governments in the name of the government of the Republic. He congratulated the members of the former congresses who continued in their persistent endeavors to attain the accomplishment of a just purpose. It was necessary, in order to triumph, to bring a force of energy superior to the force of inertia. These customs have been long tolerated. It will require a long time to modify them, but the members of the Congress have on their side the time and merit which always complete everything in the right manner. He closed by saying that he had confidence in the success of the initiative steps taken by the promoters of the Congress.

The President stated that the principal originator of the Congress was one of the officers of the Commission of Organization, Monsieur CHEDVILLE, to whom he gave the floor.

Monsieur CHEDVILLE requested Monsieur COUSIN to express to the Minister of Commerce the thanks of the Commission of Organization for the valuable assistance which he had accorded

to it. He had confidence that the Minister would take upon himself to give a definite sanction to the votes which the Congress could not fail to pass. The French Government is not the only one which has grasped the importance of this Congress, since fifteen leading foreign nations are represented by 27 official delegates, while at the Congress of Paris in 1878 there were only six powerful foreign countries represented by seven delegates.

He recalled the letter in which Monsieur DE PACHER and Monsieur MÜLLENDORF had declared that in their view, the principal end of the Congress ought to be to encourage on the part of the French Government the assembling of a diplomatic international conference which would render obligatory in all countries the unification of the numbering of yarn.

Monsieur DELCASSÉ, the French minister of foreign affairs, while favorable to this proposition, had not overlooked the fact that this class of conferences could be efficient only as the result of the establishment of a previous understanding which accordingly ought to be unanimous and that it would be possible for the refusal of a single power to wreck the conference.

Monsieur CHEDVILLE cited the report of Monsieur HETZER of Vienna who had estimated that the countries having declared the wish to adopt the metric numbering of yarn represented a population of about 120,000,000 and that the official documents showed that there were more than 550,000,000 people using the decimal system. He mentioned the resolutions taken by the 171 English Chambers of Commerce in convention last June which had declared in favor of the metric system. He had, therefore, cause to hope that the English Government would pass the bill which would render the metric system obligatory in the United Kingdom for all transactions. He then quoted the last paragraph of the letter of Monsieur DE PACHER of Austria to Monsieur ALFRED PICARD, Commissioner General of the Exposition:

"If the Universal Exposition of 1900 accomplishes the work of the actual and practical unification of the method of stating

the degree of fineness of the yarns of all varieties of fibres which the textile industry makes for cloths in the whole world, this will not be the least of the merits which will ensue from this gigantic enterprise, and future generations will be thankful to France for having accomplished this reform as difficult as it is useful in its results."

The President congratulated Monsieur CHEDVILLE for his report and proceeded to the nomination of the permanent board of the Congress, as follows:

Honorary President.

The Minister of Commerce.

Acting President.

DE PACHER DE THEINBURG, Imperial Councillor of Commerce, Austrian Delegate.

Vice-Presidents.

1. For France: CHEDVILLE, WIDMER, FLEURY, AUGUSTE ISAAC, President of the Chamber of Commerce of Lyon.
2. For foreign countries: CHARLES MÜLLENDORF, Honorary President of the Chamber of Commerce of Verviers, Belgium; Baron CANTONI, Manufacturer at Milan, Italy; VOGEL, Appellee Councillor of Commerce at Chemnitz, Germany; AUSTIN LEE, Secretary of the British Embassy; CARL SIEGFRIED, Director of the Value of Silks at Zurich, Switzerland.

General Secretary.

ÉDOUARD SIMON, Civil Engineer.

Recording Secretary.

FERDINAND ROY, Manufacturer.

Secretaries.

1. For France: TESTENOIRE, Director of the Value of Silks at Lyon; the ABBE VASSART, Director of the Technical Institute of Roubaix; ARTHUR BONTE, Director of the Value of Woolens at Tourcoing; PIALAT, Director of the Value of Silks at Saint-Etienne; CHARLES GEORGEOT, Publicist, Secretary of the French Association of Labor and Agriculture.

2. For foreign countries: BASILIO BONA, Manufacturer at Milan, Italy; WILLIAM ROWLETT, President of the Chamber of Commerce at Leicester, England; RIETER-FENNER, Manufacturer at Winterthur, Switzerland; RAFAEL PUIG Y VALLS, Manufacturer at Barcelona, Spain; ALBERT LIGON, Mechanical Engineer, representing the United States of America; HAARHAUS, Director of the Value of Silks at Elberfeld, Germany.

Corresponding Secretary.

LUCIEN BEER, Manufacturer at Elbeuf.

These several persons were elected by acclamation.

Monsieur JEAN COUSIN yielded the chair to Monsieur DE PACHER who had been chosen Acting President.

Monsieur DE PACHER thanked the members of the Congress and explained his point of view of matters appertaining to the work of the Congress. He believed that the numbering of yarns could not be introduced in every country except by the authority of a law positively ordering its use to take place on a certain date for all textile industry and for all commerce in every kind of yarn. The change would be made by a law, or it would not be made at all. He was convinced that the spinners who commenced to wind and to number their products according to the resolutions of the Congress before a law should be enacted to forbid the sale of yarns wound and numbered according to the old way, would probably keep their yarns and would be obliged to sell at a loss.

He recalled that the international relations of yarns in commerce are today too well developed for a single country, with the exception, perhaps, of France, to take upon itself such a reform without being assured that its neighbors and competitors would simultaneously do the same thing. The aim of this Congress ought to be to convince the several governments of the necessity of arranging among themselves upon the best manner of simultaneously introducing by-laws, if not identical at least based upon the same principle, the reform drawn up by the former Congresses.

He closed by saying that a great work would remain after the adjournment of the Congress, to the members of the permanent international commission which would be nominated, but he was convinced of the final success, because, he said, "The commercial and industrial advantages are on our side."

The President gave the floor to Monsieur SIMON for the report which he had drawn up in the name of the Commission of Organization.

Monsieur ÉDOUARD SIMON commenced by complimenting Monsieur DE PACHER who had had the great wisdom to follow continually since 1873 the reform to which the present Congress was devoting itself. He recalled that Monsieur DE PACHER had already presided over the Congress of Brussels in 1874, Turin in 1875 and Paris in 1878. He associated with this acknowledgement Monsieur MÜLLENDORF, Ex-President of the Chamber of Commerce of Verviers.

Monsieur ÉDOUARD SIMON also recalled the works of the former Congresses. "In proportion as human learning develops, so the international relations are multiplied. The specialists of all countries feel the advantage of uniform measures which facilitate and simplify transactions. No part of this standardizing appears to have as urgent a need as in the textile industries where in the same cloth they use textile materials of different kinds." He thought that there was not on the part of Great Britain anything that could make objections of a nature to nullify the actions of the Congress, because the English Chambers of Commerce had manifested a favorable course to the adoption of the decimal system.

Monsieur ÉDOUARD SIMON explained furthermore in order to answer an objection raised by many foreign countries who indicated that even in France the unity did not exist, that the Commission of Organization had submitted to the French Chambers of Commerce, previous to the Congress, a project to modify the numbering of cotton based upon the kilogramme the same as for the other textile materials, and replacing the old French standard for silk by a metric and decimal standard.

The Chambers of Commerce have unanimously approved these propositions.

He closed with these words:

"To sum up, the standardizing is not hindered by the attachment of the English Government to a system of measures of which the merit is merely that of age, but the principal interests represented by the Chambers of Commerce and the scholars of England, desire the adoption of the metric system, and on many occasions have clearly affirmed their approval. We hope, therefore, that the constant agitation at the home of our neighbors across the channel will help the establishment of a reform of which they will be the first to receive the benefit."

The President thanked Monsieur SIMON for his report which contained the germ of the principal problems of the Congress; he stated that this work would be set forth definitely at the later sessions of the sections.

He gave the floor to Monsieur MÜLLER, Councillor of the Imperial Office of the Interior of Berlin, official delegate of Germany.

Monsieur MÜLLER declared that "all of the interests in Germany are agreed that there is no question upon the metric system for the international numbering of yarns and that legislation alone is capable of putting it into practice, but there is a difference of opinion upon the expediency of the modification. Under these conditions the government of the Empire has not yet acted in this complicated question of such economical importance, but is continuing to study it with all the interest which it is worth, and as soon as he has good reasons to believe that Great Britain will be associated in an international regulation upon the numbering of yarns based upon the metric system, the question will reach in Germany a great step towards its solution." He closed by the declaration that "My Government considers that on the one hand it would be strictly desirable to introduce by an international understanding the unification of the numbering of yarns, but that on the other hand it would be expedient that this regulation should cover completely the inter-

ests of the industries that at the present time have bought principally in England yarns numbered in accordance with the English system."

Mr. ROWLETT, President and delegate of the Chamber of Commerce of Leicester, declared that he had always worked in England for the adoption of the decimal system, and also proposed the adoption of the metric numbering of yarns. He explained the different methods of numbering textile materials and showed all their complications. He announced that there would be submitted at the convention of the English Chambers of Commerce, which is to be held in England in a few days, a proposition to adopt the decimal system and metric numbering, but that while England adopted a metric numbering, it would be necessary that the law should impose upon spinners the obligation to indicate on their packages and on their invoices the metric numbering by the side of the present English numbering.

No one wishing to speak further, the President adjourned the session and announced that the sections of silk, wool, linen and cotton would meet in the afternoon.

The session adjourned at 11. 35 A. M.

[The records of the Silk Section, the Woolen Section and the Linen Section are omitted in this translation.]

COTTON SECTION.

The cotton section met September 3rd, at 2 P. M., at the rooms of the general Association of cloths and textile materials at 6 Rue d' Aboukir, Paris.

Monsieur FERDINAND ROY, Recording Secretary of the Congress and Delegate of the Commission of Organization made the following nominations:

President, Monsieur DE PACHER.

Vice-Presidents, Baron CANTONI, Messieurs RIETER-FENNER, and ESNAULT-PELTERIE.

Secretary, Monsieur BARAT.

These nominations were ratified.

Monsieur FERDINAND ROY gave a report which he submitted in the name of the Commission of Organization. It pointed out the efforts made by the Commission in order to reach practical results in France. That it was in this manner that the Chambers of Commerce of textile districts who were consulted, pronounced themselves unanimously in favor of the modification of the present French method of numbering cotton based upon the number of kilometres to the half kilogramme and in order to conform to the decisions of former Congresses requested that textiles, (with the exception of silk), should have a single method of numbering represented by the number of metres to the gramme or kilometres to the kilogramme.

He cited that a decree of December 14, 1810, had enacted this standard but unfortunately the ordinance of May 26, 1819, was repealed in this respect. The Commission of Organization, in taking up the question, wished to submit to the favorable view of the foreign delegates that on their part they should make every effort to obtain from their representative governments the elimination of the different irregular methods of numbering.

The President requested the delegates of foreign govern-

ments to make known the instructions which they received from their governments.

Monsieur RIETER-FENNER, Swiss Delegate, said that he was authorized to declare that the Federal Council assented to all these declarations, and all of the decisions which the Congress should take. It is favorable to the introduction of the metric system of numbering in common with other countries.

Monsieur MÜLLER, German Delegate, referred to the note which he had read at the opening session. He hoped that there would be a general agreement, and in the name of the German government he assented to the resolutions which Congress would pass.

Baron CANTONI, Italian Delegate, stated that it was at the last moment that he had received the commission of the Italian Government to represent it at the Congress and that he did not have any exact instructions, but he reminded them that the Italian Government had always shown itself very favorable to the introduction of the metric system in the numbering of yarn. The only difficulty appeared to come from the fact that Italy being a country devoted to the exportation of yarn, the Italian manufacturers are obliged to pack and number for export according to the English manner. It appeared to him, therefore, essential to urge this upon the English Government, without which it would be difficult for the Italian Government to make a law requiring the metric numbering.

Monsieur ESNAULT-PELTERIE was persuaded that since the great nations, such as France, Germany, Austria, Italy, etc., are unanimous for a single system, England will understand that it is to her interest to adopt that also.

Monsieur MÜLLER reserved his action respecting those matters which were covered by the proposed resolution demanding a diplomatic conference in order to reach an international understanding, as he had no instructions from his government in this respect.

The President stated that it was within his knowledge that the Austrian Minister had received in Berlin the news that the

German Government is prepared to take part in such a conference.

Monsieur FERDINAND ROY asked Mr. BRIGSTOCKE, the English Delegate, if he could indicate what were the inclinations of the English Government.

Mr. BRIGSTOCKE replied that he had not yet received any instructions.

Monsieur FREY asked that the Section should determine the time of transition which ought to be provided in the law enacting in every country the exclusive adoption of the metric decimal system of numbering,

After a discussion in which many members took part, it was decided to propose to the general assembly the following draft:

" That a delay of two years for the promulgation of the law requiring the adoption of the metric system of numbering may be granted for the operation of these new legal measures."

All of the other resolutions proposed by the Commission of Organization were adopted.

At the end of the assembly of Sections, the presidents of these Sections and secretaries met to draw up the resolutions to be proposed at the general assembly of the Congress.

GENERAL ASSEMBLY.

The General Assembly was held September 4th., at the Palace of Congress, Monsieur DE PACHER, Austrian Delegate, in the chair.

The President gave the floor to Monsier FERDINAND ROY, Recording Secretary, to read the resolutions which were submitted by the officers of the different sections.

First resolution. *For all textile materials under the following reservations concerning raw and finished silks, the number is to be expressed by the number of kilometres to the kilogramme.*

This resolution was adopted unanimously.

Second resolution. *The length of the skein permissable for all kinds of wound yarn is fixed at 1,000 metres with decimal subdivisions.*

This resolution was adopted unanimously.

Third resolution. *Every method of winding is permissable on the condition that it gives 1,000 metres per skein.*

This resolution was adopted unanimously.

Fourth Resolution. "The number of all twisted yarn, either dyed or bleached, is to be determined without any other condition by the number of metres contained in a gramme."

Monsieur DUCHÊNE offered the amendment "by the number of kilometres contained in the kilogramme."

Monsieur DE PACHER remarked that the question had been considered in the former Congresses and that in accordance with the principle they had chosen the most simple formula, the unit of weight being the gramme and the unit of length being the metre.

Monsieur PELTZER DE CLERMONT asked why it stated dyed or bleached yarn.

Monsieur FERDINAND ROY stated that it had only followed one of the resolutions passed by the preceeding Congress.

Monsieur A. SEYDOUX proposed to insert, "unbleached, twisted yarns, dyed or white."

After a discussion in which Baron CANTONI, Messieurs PELTZER DE CLERMONT and SEYDOUX took part, Monsieur FERDINAND ROY moved to omit the words "dyed or bleached", and to give explanation in the text as modified.

Fourth resolution. *The number of all twisted yarn is determined, except when stipulated to the contrary, by the number of metres contained in a gramme.*

The fourth resolution as amended was put to a vote and adopted unanimously, except three votes to the contrary.

Fifth resolution. 1st. part. *The standard of raw and finished silk is determined by the weights in half decigrammes of a length of 450 metres.*

Monsieur VOGEL asked why they had not adopted the resolution of the former Congresses fixing the length at 500 metres.

Monsieur CHAMONARD replied that the length of 500 metres would unsettle the customs in such a manner that it would never be used; besides the Silk Section had passed a vote on this subject of which an explanation would be given to the Assembly.

The President asked Monsieur TESTENORIE to speak on this vote. (The statement is inserted in the report of the meeting of the Section on Silk, omitted in the translation.)

After the complimentary explanations by Monsieur CHAMONARD, the first part of the fifth resolution was adopted.

2nd. part. *The samples will be made upon twenty skeins of 450 metres and the partial results will be written under the customary form.*

The second part was adopted unanimously.

3rd. part. *The bulletin will also indicate under the denomination of the number, the weight in grammes of 10,000 metres.*

The third part was adopted unanimously.

4th., and last part. *In every country the standard bulletins will be made upon the same model.*

The fourth part was unanimously adopted.

Sixth resolution. *The basis of the standard of numbering is conditional.*

This resolution was adopted unanimously.

Seventh resolution. *The conditions will be optional, but it should be obligatory upon the request of one of the parties. It will be absolutely dry without altering the fibre by adding to the weight the correction established by local usages.*

This resolution was adopted unanimously.

These propositions adopted by the several votes were submitted to the consideration of the General Assembly.

Monsieur FERDINAND ROY moved that the Congress issue the following votes:

"That in accordance with the proposition of the Commission of Organization, the French Minister of Commerce and Manufactures wishes to present to Parliament a plan for a law having this purpose:

1st, the repeal of the law of 1819 concerning cotton yarn and the return to the general lines of the decree of 1810 that the numbering may be based upon the number of metres to the gramme.

2nd. The modification for raw and finished silk of the law of June 13, 1866 and the adoption as the legal standard approved by the Congress and based upon the weight in half decigrammes of a skein of 450 metres."

A discussion then took place upon the point as to whether the foreign delegates could take part in a vote concerning this action which did not apply except in France.

Monsieur MÜLLENDORF of Belgium thought that a general vote would have a moral effect and an approval given to the French members who would offer the best example throughout the entire world in demanding from their country the modification of the laws regulating the numbering of yarns which were not found to be in accordance with the decisions of the Congress.

The President consulted the Assembly upon the advisability of a general vote; the majority favored the affirmative.

After a discussion in which Messieurs COUSIN, ED. SIMON, MÜLLENDORF, FERDINAND ROY, WIDMER, A. ISAAC, PELTZER DE CLERMONT and STROHL took part, the phraseology of this vote was amended as follows:

First vote. *The Congress is of the opinion that for France, in conformity with the proposition of the Commission of Organization of the Congress of 1900:*

1st. *The royal ordinance of May 26, 1819, should be repealed and a provision substituted imposing for cotton, wool and spun silk a numbering based upon the number of kilometres contained in a kilogramme.*

2nd. *The law of June 13, 1866, concerning raw and finished silk should be amended and the standard admitted by the Congress based upon the weight in half decigrammes of the small skein of 450 metres should be adopted as the legal standard.*

In this form the first vote was adopted.

Monsieur FERDINAND ROY read a paper on the second vote.

Second vote. *That the provisional approval given by the decree of 1810 may be made obligatory in France.*

Monsieur A. ISAAC believed that it would be imprudent to vote the proposed phraseology. He thought it would be preferable to find a wording which would invite the government to seek in the scope of the decree of 1810 the most proper course to make the decisions of the congress for the numbering of yarn respected rather than to ask the Government to use a weapon so old that it could turn against us and produce results which we would be the first to regret. He believed that it would be better not to speak of the decree of 1810, but simply of international measures approved by competent men who would study the best means of practically carrying out the resolutions of the Congress. If it is to our interest to count the number of cotton, wool, or the standard of silk in a certain manner, we shall reach that only by the force of persuasion and not by the application of the rigors of the law. In short, he trusted that the Congress would not make any appeal to the penalties of a law to enact the decisions which it had passed and he requested the defeat of that vote.

Monsieur JEAN COUSIN, said that he was obliged, as representing the Minister of Commerce who had charge of enforcing the law and who was not to discuss when it existed, to make all the reservations on the point of a penal view on the application of the law of July 4, 1837, which had established the metric system of weights and measures in France. That law formerly forbade all denomination of weights and measures other than that which existed in the table annex to the aforesaid law.

Monsieur CHEDVILLE, replying to Monsieur ISAAC, declared that no more than he, did the Commission of Organization wish to cause new impediments to the industrial work, but that if one should examine what occurred in practice it would be proved, that in spite of the law of 1810 and the forcible efforts made by

the industrial societies and chambers of commerce, old usages and local numberings in France prevailed under the empire. The Commission has thought therefore that it should need some word of approval.

Monsieur SIMON of Germany was of the opinion of Monsieur ISAAC, that it was not necessary to threaten but rather to persuade.

The Assembly, on being consulted, were in favor of the suppression of the second vote.

Third vote. *That a diplomatic conference should be held to reach an international understanding.*

This vote was adopted unanimously.

Fourth vote. *That after the promulgation of the laws and decrees enacted at the instance of the international diplomatic conference, the importation of foreign yarns wound in a form deemed illegal shall be prohibited in the countries adopting the new system.*

Monsieur GUÉRIN declared that if one applied this provision to the linen industry before an understanding with England it would cause the destruction of the linen industry because of the great international commerce in linen yarn.

Monsieur FERDINAND ROY stated that the Commission admitted that, exceptionally for linen, it would be necessary to rest in *statu quo* until an understanding may be arranged with England.

Under this reservation, this vote was adopted unanimously, excepting two votes.

Fifth vote. *That a delay of two years to provide for the promulgation of the laws and decrees in different countries may be accorded for the application of these new legal measures.*

This vote was adopted unanimously.

The Congress finally passed the following declaration:

The Congress approves the nomination of a permanent commission charged to petition foreign governments and the French government for the enactment of the resolutions and votes of the Congress.

This resolution was adopted unanimously.

Finally, the Congress voted to send the following address* to the Association of the Chambers of Congress at London, to be transmitted to the Chambers which were represented in the Convention held at London last June:

"The French and foreign manufacturers and sales agents assembled at Paris, September 4, 1900, in the presence of the international Congress for the unification of the numbering of yarn."

"Being persuaded that the metric system of weights and measures is soon to be the only one used in all countries."

"Convinced that for the facility of transactions and the simplification of accounts, it is desirable that this result may not be delayed."

"Considering that the only obstacle is that of the English system and that if the English Government adopted the metric system the question would be solved."

"Extending to the 171 Chambers of Commerce of the British Empire assembled at London from the 26th to the 29th of June, 1900, their sincere congratulations for the motion which they have passed requesting their government to make the metric system obligatory after a period of two years."

"Have passed these votes in order that the English Government may reply after the shortest delay to the requests of the British Chambers of Commerce and at the same time at the desire of all countries which should be in harmony with business affairs of Great Britain."

This address was unanimously adopted.

Mr. BRIGSTOCKE, English Delegate, read at this point a declaration, of which the following are the principal passages:

"For all countries where the decimal and metric system is obligatory, the application of the resolutions passed by the Congress of Paris in 1878 no longer presents the same difficulties as for England where the situation is entirely different: its duo-

*See page 261.

decimal system is the principal obstacle to putting the plan in practice."

"You are not unaware that England is the proper consumer of the greatest part of the product of her spinning mills, without mentioning her colonies and North America where the English weights and measures are legal; on the other hand, her system of numbering of yarns has so entered into the practice of international commerce that it is practically impossible to compel her spinners to adopt two different systems."

"The international unification of the numbering of yarns based on the metric system, according to the opinion of the English Government, is not, under the present circumstances, acceptable with us, and I should add that this opinion is participated in almost unanimously by the English spinners themselves."

"Moreover, I will recall to you the fact that under date of July 22, 1897, a bill authorized the optional employment in the United Kingdom of the metric system concurrently with our national measures, and that up to the present time, this optional usage has remained a dead letter. We can, then, infer that the spinners prefer to continue the present system, which is fully understood in all markets."

"It is for these various reasons that my colleague and myself feel bound to declare that the Government of Her Majesty has accepted representation at this congress, not because it believes the adoption in England of the proposed system possible, but because its delegates can follow up with the greatest attention your debates and give a report of all the resolutions that you have adopted and the motives which prompted them."

Monsieur CHEDVILLE thanked Mr. BRIGSTOCKE for his unexpected communication which informed the Congress on the intentions of England. He said that in spite of their discomfiture, the members of the Congress hoped that matters would progress more quickly than the English Government believed it would, and that it would not show itself too reluctant to the adoption of the metric system.

The President asked if any foreign delegates had any communications to make.

Chevalier MITSCHA DE MAERHEIM announced that the Imperial and Royal Minister of Austria consented to be represented on an international committee which would be chosen by the Congress and charged to follow out, concurrently with different Governments, the formation of a diplomatic conference with the object of settling in a uniform manner the question of the numbering of yarns.

Monsieur RAFAËL PUIG Y VALLS said that, as a delegate of Spain, he conformed to the decisions of the Congress.

Monsieur CHEDVILLE proposed that the permanent international Commission be composed of the present Board of the Congress, adding to it representatives of Governments which were not already on this Board.

This proposition was adopted unanimously.

The order of the day being finished, the President thanked Monsieur JEAN COUSIN for the co-operation which the French Government had given so fully to the Congress, and after having thanked the members of the Congress and the representatives of the French and foreign governments, he declared the Congress for the unification of the numbering of yarns adjourned.

PERMANENT COMMISSION.

Immediately after the adjournment of the Congress, the members of the Permanent Commission met; Monsieur DE PACHER in the Chair.

On his proposition the Commission elected its board.

Then he appointed the foreign delegates to constitute, each in their respective countries, executive committees to exploit the decisions passed by the Congress and to request their governments to take part at the proposed diplomatic conference.

MEMBERSHIP OF THE PERMANENT INTERNATIONAL COMMISSION,

ELECTED AT THE GENERAL ASSEMBLY, SEPTEMBER 4, 1900.

FRANCE.

Honorary Presidents.

ÉMILE WIDMER, former Manufacturer, 25, rue de Saint-Petersbourg, Paris; GUSTAV DE PACHER, Councillor of the Imperial Commerce, former Deputy.

President.

FERDINAND ROY, Manufacturer, 38, rue des Jeûneurs, Paris.

Vice President.

DÉSIRÉ CHEDVILLE, Manufacturer, Member of the Chamber of Commerce d'Elbeuf à Saint-Pierre-lez-Elbeuf (Seine-Inférieure.)

General Secretary.

PAUL FLEURY, Engineer, Manager of the Counting-house of Linen Industry, 9, rue d'Uzès, Paris.

Secretaries.

ÉDOUARD SIMON, Civil Engineer, 89, boulevard du Montparnasse, à Paris.

CHARLES GEORGEOT, Secretary of the Association of French Industry and Agriculture, 1, place Boïeldieu, à Paris.

PERSOZ, Director of the Value of Silks at Paris (Bourse du Commerce rue du Louvre.)

Members.

ISAAC, President of the Chamber of Commerce at Lyon.

TESTENOIRE, Director of the Value of Silks at Lyon.

ARTHUR BONTE, Director of the Value of Woolens at Tourcoing.

FIC PIALAT, Director of the Value of Silks at Saint-Étienne.

BIPPER, Director of the Value of Silks at Roubaix.

LUCIEN BEER, Manufacturer at Elbeuf.

FOREIGN.

GUSTAV DE PACHER DE THEINBURG, Councillor, ex-Deputy at Vienne.

CHARLES MÜLLENDORF, Honorary President of the Chamber of Commerce of Verviers.

Baron COSTANZO CANTONI, (Italy,) 12, via Brera, at Milan.

H. VOGEL, (Germany,) Appellee Councillor of Commerce at Chemnitz.

Colonel SIEGFRIED, (Switzerland,) Director of the Value of Silks at Zurich.

BASILIO BONA, (Italy,) Manufacturer, Member of the Chamber of Commerce of Turin, at Caselle-Torinese.

W. ROWLETT, (England,) President of the Chamber of Commerce of Leicester, 34 Newark street.

OSKAR HAARHAUS, (Germany,) 12 Hofauerstrasse, at Elberfeld.

M. BRIGSTOCKE, (England,) 9, avenue de Malakoff, at Paris.

EDWARD BLOMBERGH, (Sweden), Manufacturer, at Norrköping.

RAPHAËL PUIG Y VALLS, (Spain,) of Barcelone.

ALBERT LIGON, (United States,) Engineer, 35, rue des Petits-Champs, at Paris.

KOPOSSOFF, (Russia,) Professor to the Minister of Finances, at Saint-Petersbourg.

JOSÉ C. SÉGURA (Mexico,) Engineer, Director of the National School of Agriculture of Mexico.

IMANISHI, (Japan,) Engineer, Assistant Director of the Imperial Value of Silks at Yokohama.

LOUIS BALLAI, (Hungary,) Department Councillor to the Minister of Commerce of Budapest.

GRÉGOIRE HUMRUZ, (Turkey,) Engineer-Counsel of the port of Salonique.

VICTOR CONROT (Luxembourg,) Director of Luxembourg Draperies at Pulfermulh.

NOTICE.

All communications should be addressed to Monsieur PAUL FLEURY, Sécrétaire Général, 9, rue d'Uzès, à Paris (11e arrondissement).

REPORT PRESENTED TO THE MINISTER OF COMMERCE, MANUFACTURES, MAILS AND TELEGRAPHS,

BY MONSIEUR FERDINAND ROY,
Corresponding Secretary of the Congress.

[Translated by Mr. C. J. H. WOODBURY.]

Mr. Minister—

In accepting the honorary presidency of the international Congress for the unification of the numbering of yarns, you have testified to the interest that you have in its actions; moreover, the members of the Congress have regretted that your absence from Paris prevented you from presiding at the opening session.

In the name of the Board and in the office of corresponding secretary, I am deputized to call your attention to the resolutions which have been passed and to solicit your able co-operation for putting them into practice.

First, I beg to draw your attention to the promptness with which the foreign Governments have responded to the invitation of the Commission of Organization.

At the last Congress held at Paris in 1878, Austria, Belgium, Italy, Sweden and Switzerland were the only ones represented by official delegates. But this year, to the delegates of these six governments have been added the delegates of Germany, the United States, Great Britian, Hungary, Luxembourg, Japan, Mexico, Russia and Turkey, making in all fifteen countries represented by twenty-six official delegates.

With the exception of Holland, all the countries where the textile industry occupies a position of however little importance, have been represented officially. Is it not an evident proof of the growth of sentiment which is exhibited in all the countries in favor of the unification of the numbering of yarns? As to the rest, all the official delegates — except the English delegates — have brought the favorable opinion of their governments and of the manufacturers of their countries.

Morever, they have been unanimous in asking for the assembling of a diplomatic, international conference in which would be discussed the possibility of adopting simultaneously, and in all countries, with or without England, for all textiles, or for a portion of textiles, the unification indicated by the Congress.

The international situation for the numbering of the different textiles is as follows:

For raw and finished silk, the opinion of the Congress, as stated below, is unanimous. The diplomatic Conference could easily prepare for adoption as the legal standard in all countries some standard adopted by the Congress.

For cotton, wool, linen and spun silk, all the delegates have declared that their governments were in principle partisans of the metric numbering. The English Government alone, has made known through the medium of her official delegates that the existing English numberings could not be modified until the day when the metric decimal system would be rendered obligatory in England, and that, even then, they could not be certain that the spinners would be disposed to entirely abandon their old practices.

In view of the declarations of the English delegates, the French and foreign representatives of the linen industry have declared that in spite of their earnest desire to adopt the metric numbering, they could not do so until England had effected the same change, for the reason that there was a great deal of international commerce in linen yarns numbered according to the English system.

The same difficulties do not occur for the industries of cotton, wool and spun silk. Many delegates have properly raised some difficulties on the subject of the possibility of making the unification without the co-operation of England, but we think that these could easily be removed in a diplomatic conference.

These are the questions adopted by the Congress as worthy of being discussed to a finality by the diplomatic conference.

1. Unification of the standardization or raw and finished silk in conformity to the resolution passed by the Congress of Paris in 1900;

2. Unification of the kilogrammetric numbering of wool, cotton and spun silk in all countries except England, expecting that England, by the general adoption of the metric decimal system, then of the metric numbering, will be added to the concurrence of the other countries. Linen would be excepted provisionally for the reasons announced above.

3. The adoption of the kilogrammetric numbering for all the classifications of the custom tariffs. (At the present time the custom tariffs of Germany, Austria and Spain, are established according to the English numbering. The Belgian tariff for cotton is calculated on the num-

ber representing the number of kilometres contained in the half kilogramme as in France.)

I have indicated to you above the communications made by the delegates of the English Government; inasmuch as the attitude of England is one of the delicate points, permit me to give you the impression of the members of the Congress:

This impression is that the manufacturing and commercial interests of England are fully persuaded that it is to their advantage to adopt the metric decimal system, and that the opposition comes rather from the Government.

Indeed, the Congress has put in evidence the resolution passed by the 171 Chambers of Commerce, both of England and her colonies, which met at London this summer, petitioning the passage by Parliament of a bill rendering the metric system obligatory after a period of two years. It is true that one of the official delegates of England has maintained that the Congress ought not to attach so much importance to this vote which was sentimental, the Chambers of Commerce demanding for the form an improvement which they knew there was no chance of passing for a long time in the future.

Since the Congress, I have had the opportunity to consult some members of the most important Chambers of Commerce of England, and they have formally assured me that far from being sentimental, the vote expressed by the Chambers of Commerce was the most serious and indicated without the possibility of a doubt, the favorable feeling and positive benefit from the English industry and commerce accompanying the metric system.

However, at the same Congress, Mr. Rowlett, President of the Chamber of Commerce of Leicester, was the representative of their numerous English manufacturers who find their numbering of textile materials undesirably complicated. How could it be otherwise, when one sees that in England there are as many different numberings as there are textiles, cotton, wool, linen and spun silk.

At present, one of the arguments of the English Government is this: the international commerce is carried on under the English numbering and this proves how much this numbering has entered into the customs so that even in certain countries where the metric system is obligatory, the custom tariffs are established for yarns according to the English numbering. It is for this that we propose that for the future the custom tariffs may all be established according to the metric numbering.

The Congress has proposed that from the day when a certain number of countries will be united in making the unification, the introduction of yarns which are not wound and numbered metrically, may be prohibited.

This clause would not prevent, as some fear, the introduction of yarns wound according to the English method, for I can assure you that the English spinner readily favors dividing and numbering yarns metrically. You can obtain an account of it, Mr. Minister, by applying to the French custom house: It will tell you that the very great majority of English cotton yarns imported in France are wound metrically. The only inconvenience that this measure would involve would be to deprive the foreign manufacturers of the privilege of drawing from the stocks of wound yarns existing in England, stocks which necessarily are made according to the English winding.

The Italian delegate has pointed out that the Italian spinner, exporting much in the Mediterranean in concurrence with the English spinner could not export otherwise than by following the English customs. To this the reply was made that the metric numbering would be required only for the interior consumption of each country, but that for exportation the spinners would always be free to yield to the demands of each market.

I believe, therefore, that these small difficulties can be removed in a diplomatic conference, and that all the countries, excepting the momentary exclusion of England, can be unanimous in simultaneously making the unification.

I am going to speak to you, Mr. Minister, of the international question. It remains for me to talk with you of some exclusively French questions which have been presented to the Congress, by pointing out to you that the foreign members have much desired to vote with the French members and to recommend the changes which they were demanding in order to bring about the unification, at least in France. These two measures are of importance.

1st. The standardizing of silk.

2nd. The numbering of cotton.

For raw and finished silk, France has maintained up to the present time the old standard; the grain or denier (a copper coin weighing 1 ¼ grammes) being the unit of weight and the ell being the unit of length. The legal standard indicated by the law of June 13, 1866, and express-

ing the weight in grammes of a small skein of 500 metres has never been adopted by commerce.

The preceeding Congresses have proposed to adopt as a uniform and international standard, the weight in grammes of 10,000 metres of yarn. It is this standard that the Commission of Organization asked the Congress to confirm. But after a meeting held at Lyons in the course of the summer and when the directors of the principal manufacturing establishments of France and of foreign countries had advised the adoption as the uniform, international standard of the legal Italian standard expressing the weight in half decigrammes of the small skein of 450 metres, the Silk Section and afterwards the General Assembly of the Congress adopted this resolution.

For cotton, the legal and usual French numbering indicates the number of kilometres contained in the livre or half kilogramme, while for other textiles, wool, spun silk and hemp, the number indicates the number of kilometres to the kilogramme. This is an anomaly which ought not to exist. It is much preferable that the number of cotton yarn be based upon the kilogramme. The Commission of Organization of the Congress has consulted the Chambers of Commerce in all the textile centers in France, and all have appoved this modification.

Accordingly, Mr. Minister, the members of the Congress have charged me to ask you:

1st. To revoke the ordinance of May 26, 1819, substituting for it a provision imposing, for cotton, wool and spun silk, the numbering based on the number of kilometres contained in the kilogramme.

2nd. To modify the law of June 13, 1866, concerning raw and finished silk, in order to adopt as the legal standard the weight in half-decigrammes of the small skein of 450 metres.

If you will indeed bring about these two reforms, France would assuredly give an excellent example to the other countries, who, on their part, would desire to suppress the irregular numberings among them.

Outside of the introduction of these reforms in France, there is the international question which I have submitted to you in the first part of this report.

The members of the Congress have elected a permanent, international commission charged with endeavoring to obtain simultaneously among their different Governments, the assembling of a diplomatic conference. I have the honor to be the President of this Commission,

and I am going to ask you in its name to fully consent to advocate before the Minister of foreign affairs, our request for a meeting of this diplomatic international conference.

Please accept, Mr. Minister, the expression of my highest esteem and respect.

FERDINAND ROY,

Recording Secretary,

President of the Permanent International Commission.

GENERAL REPORT ON BEHALF OF THE COMMISSION OF ORGANIZATION.

BY ÉDOUARD SIMON, *Secretary.*

[Translated by Mr. C. J. H. WOODBURY.]

It is our good fortune to have with us a number of pioneers, among the most eminent of them being Monsieur VON PACHER, who had the great merit to urge without ceasing, since 1873, the reform for which we are seeking in our turn, your active and persistent alliance. It is an agreeable duty to welcome at the beginning of this session the Recording Secretary of the Congress of Vienna who presided with impartiality and constant fidelity to duty successively over the Congresses of Brussels, Turin and Paris.

We find here, always animated by the same ardor, a worthy representative of the important concentration of industries at Verviers, Monsieur MÜLLENDORF, honorary President of the Chamber of Commerce.

Unhappily indeed, gaps have been made in our ranks, and we deplore the absence of devoted associates, illustrious leaders, such as POUYER-QUERTIER and MICHEL ALCAN.

There is an obligation on our part to present a history of the question, to explain the motives of certain essential particulars adopted by the former Congresses in order to introduce the new members and to cause them to take the place of their predecessors without hesitation or apology.

In this connection, the report addressed, in 1874, to the Minister of Commerce by MICHEL ALCAN, delegate of the French Government to the Congress of Brussels, furnishes some very useful suggestions of which we cannot do better than to reproduce the principal passages:

"For a long time," wrote MICHEL ALCAN, "the enlightened

manufacturers and merchants of all countries have recognized the necessity of a reform from the double views of the facility and honesty of commerce, but no initiative was taken on this subject until the last universal Exposition at Vienna, in 1873. The Chambers of Commerce of manufactures at Lower Austria, placed itself at the head of the movement, in order to accomplish the unification of the standard, and a former Congress, under the presidency of Baron VON RECKENSCHUTZ was held at Vienna the same year. This assembly, of which the Recording Secretary was Monsieur GUSTAV VON PACHER VON THEINBURG, a leading Austrian manufacturer, recognized, after discussion, the advantages of the metric decimal system and adopted for the basis of the new standard the kilogramme as the unit of weight and the kilometre as the unit of length,

In spite of the simplification which should result from the general adoption of these units, there were certain difficulties in their application and objections to details. The novelty of the system for many countries showed the necessity of a new international Congress which was called at Brussels, September 21, 1874, by the Chamber of Commerce of Vienna with the approval of the Belgian Government."

At the request of the central committee, sixty official delegates responded, representing the manufacturing countries of Europe.

England herself wished to prove by sending commissioners, her interest in the project.

The questions with which this Congress occupied itself were the following:

I. Is it desirable to maintain the principle adopted by the former Congress, to admit as the basis of the universal standard the metre and the gramme?

The response was unanimously in the affirmative. In consequence, excepting the modification which will be mentioned later and which applies to silk, No. 1 will correspond to a length of one metre weighing one gramme, or 1,000 metres weighing one kilogramme for all kinds of yarns.

If a double length is the same weight, that will be number 2, and so on in proportion.

II. Is it necessary to prescribe a skein winder of determined form and dimensions when it is a question of transforming the yarn into skeins? Should this skein winder be modified according to the nature of the yarns?

It has been recognized that the application of the metric standard is independent of the system of skeins, the legal length of 1,000 metres being the result of a circumference which can be varied according to the number of revolutions of the skein winder or of any other mechanical device made for that end.

The second part of the question is answered by the reply to the first. It is evident, moreover, that the same machine could serve in the skein winding of all kinds of textile materials, if the methods of the consumers and the customs of manufacturers did not require different lengths of skeins and relying upon the practical facts and wishing to facilitate the extension of the metric system, the Congress has not rejected any of these circumferences capable of giving a length equal to 1,000 metres.

III. Is it necessary to adopt for a standard of raw or thrown silk yarn a numbering identical with that of other textiles; that is to say, the decimal metric standard? Should the scale of numbers increase in the manner that the highest number corresponds with the finest yarn, as in other specialties?

The international Congress of Vienna in 1873 had resolved affirmatively on these two questions, but after investigations, following the careful discussions in the meetings, the special committee, in the name of which the Commander, JOSEPH FERRERO, delegate of the Chamber of Commerce of Turin made a remarkable report, proposed, and the Congress of Brussels unanimously ratified the following resolutions:

a. The numbering of raw or thrown silk will be based like that of other textile materials upon metric and decimal measures with 1,000 metres for the unit of length and the decigramme for the unit of weight.

b. In order to conform with the commercial usages of all silk

raising countries, the scale of numbers will be based upon the variable weight with a fixed unit of length, and the samples will be made on the length of 500 metres.

"As one sees", concluded MICHEL ALCAN, "the principle submitted by the Congress at Vienna has been maintained, but the elementary method adopted by that Congress has been modified in conformity with ordinary and correct practice. In the case of silk, the yarn of various sizes is obtained from the finest element by joining a greater or less number of these elements, while for other materials, the spinner takes a fibrous mass which diminishes progressively. This method of inverse work imposes upon the state in which these first materials are made a method of numbering where the graduation is evenly reversed."

This gives a practical consideration which does not impede in any manner the application of the metric decimal system which caused the Congress to determine to adopt 500 metres for the legal length of samples in the public market. Twenty samples made upon small skeins of 500 metres, as is already done in practice, shows the irregularities of the thread in a more evident manner than ten samples of 1,000 metres in length.

Our colleague, Monsieur JULES PERSOZ, in his last work on l'Essai des Matières Textiles, (The Testing of Textile Materials) recalls that the Congress of Turin in 1875 endorsed the above conclusions that had been studied and adopted in accordance with the common view of the last details of the application, and that later, the Congress of Paris, in 1878, through its Recording Secretary, Monsieur GUSTAVE ROY, former President of the Chamber of Commerce of Paris impressed the French Government on the question in which we are interested and asked for the assembling of a diplomatic international conference.

The initiative by individuals meets too great obstacles to hope for a solution in conformity with our views, through public sentiment, without the intervention of the governments, of the several manufacturing countries in the adoption of concurrent, legislative measures. The Minister of Commerce, the Honorable

Monsieur TEISSERENC DE BORT, to whom the delegates of the Congress of 1878 submitted an address, was of the same opinion and was among the first to grasp the importance of the desired reform. Continually, in spite of the cordiality with which it welcomed the votes of this last Congress, no practical sanction has been manifested to this day.

The Universal Exposition of 1900 presented to some among you an exceptionally favorable occasion for taking up this question for the unification of spinning and methods of sampling these materials. In proportion as human knowledge is developed, and international relations multiply, the specialists of all countries will appreciate the necessity of uniform measures which facilitate and simplify transactions.

No part of the need of uniformity appears as imperative as that of the textile industries where in still smaller and smaller degree the manufacturers are limited in the choice of textile materials. Sometimes by the necessities of economy, sometimes to satisfy the demands of fashion, now and then to comply with the double conditions of economy and novelty, the manufacturers combine in the same fabrics yarns of different nature and standard. It is not rare to find in a cloth threads made of a mixture of different materials, but with warps where are placed side by side plain or twisted cotton, spun silk, worsted, with silk filling, or just the contrary. This instance will warrant the unification in the interests of the manufacturer who is obliged to give his personal attention to long and difficult calculations without profit to anyone, calculations only for the purpose of bringing to the same standard the numbers of yarns of various countries to make the conversion of standards which are variable with the country and also with the nature of the materials.

After having previously communicated their views, two promoters of this Congress, Monsieur CHEDVILLE, President of the Association of Woolen Spinners of the Lower Seine, of l'Eure and of Calvados, and Monsieur VON PACHER, whom you already know, found themselves upon the same ground; to improve to the best possible advantage the reunion at Paris of the manu-

facturers of all countries to reach the desired unification of which the principle was decided 25 years ago and which still remains otherwise.

Under the auspices of the Commissioner General and with the approval of the untiring delegate of the Congress, Monsieur GARIEL, a Commission of Organization, of which the members have been obtained in the principle centers of spinning and weaving, which is fundamentally attentive to the state of opinion in France and foreign countries. It is necessary, indeed, before impressing the public powers anew as to our desires to know if these votes still conform to the wishes of those principally interested.

Thanks to the energy of our President and senior member, Monsieur WIDMER, whose strength does not diminish by years, thanks to the devotion of our Treasurer, Monsieur FLEURY, who does not spare either time or labor, the French and foreign Chambers of Commerce, the Consulting Chambers of Arts and Manufactures, the Manufacturers Associations have been consulted through the medium of circular letters prepared and signed by all the officers of the Commission of Organization upon the usefulness of the projected Congress, and upon the immediate practicability of the unification.

We will not tire you by the details of that correspondence. We will keep within bounds by indicating the result: "All of the French Chambers of Commerce in the textile centers, with the exception of two, at the date of the third of last July, have passed the resolutions endorsing the unification of the numbering of yarns." At the same time the Minister of Commerce, at the request of our President in the issue of this inquiry, wished to prove the interest which he had in this reform in accepting the honorary presidency of the Congress and in appointing to carry out its work, two delegates of his ministry, Monsieur BRITON, Assistant Director of Manufactures, and Monsieur COUSIN, Assistant Director of Commerce.

On his part, the Minister of War has appointed Monsieur JASSERON, Assistant Military Superintendent of the first class.

Finally, the Minister of Foreign Affairs has given to our Pres-

ident the assurance of his essential coöperation for the assembling of a diplomatic, international conference if, as it is hoped, all of the resolutions of this Congress are consistent with the conclusions of the former Congresses.

What then could be a stumbling block today? What is the nature of any objections to impede so great efforts?

It is important to reply in all candor to this inquiry. Great Britain, in refusing to adopt the decimal metric system, constitutes the principle obstacle — and we should not say that we owe it to Great Britain, but to the government of Great Britain — because there is manifested in the Chambers of Commerce of the United Kingdom, a very favorable opinion towards the adoption of the decimal and metric weights and measures. Among the tentative proceedings in this direction by the delegates of a great number of English Chambers in 1895, Minister BALFOUR only opposed the question of the suitable opportunity, declaring that the education of the English people had not been sufficiently developed and that it would be necessary to prepare the young generations for the introduction in the programmes of teaching, the study of the metric system, that moreover, in our own country, absolute unity does not exist.

This last objection was a blow to us and your Commission of Organization is preparing to disprove it. It seems to me that in order to be perfectly logical, it is necessary to break away in a definite manner from the former usuages which have only in their favor the force of custom, so that it is necessary to give a good example in substituting the kilogramme for the half kilogramme as the basis of the numbering of cotton yarn.

This transformation is simple, since it is easy to multiply the actual number by two, that is to say, to double it in order to obtain the proposed standard number.

You will find among the sections of the imperial decree of December 14, 1810, one closing as follows: "All dealers in yarn will be obliged to form the small skeins of cotton, linen, hemp or woolen yarn in a thread of 100 metres in length and make the skein of 10 of these small skeins in such a manner that the total length will form a skein of 1,000 meters. These yarns

will be labelled a number indicating the number of skeins necessary to weigh a kilogramme."

Unfortunately, the Royal ordinance of May 26, 1819, annulled the decree stated above and decided that all cotton yarns intended for French fabrics will be labelled by the date of October first of the same year with a number indicating the number of skeins necessary to form the weight in metric pounds or half kilogramme.

At the request of the principal Chambers of Commence interested, we have requested the Minister of Commerce to ask of Parliament the repeal of the law of May 26, 1819, and to return to the text of the decree of December 14, 1810.

We have thought that there would also be an opportunity to modify, in conformity with the conclusions of the former Congresses, the French law of June 13, 1866, in accordance with which the standard of silk is represented by the mean weight expressed in grammes of a small skein of 500 metres, the sample being made upon 20 small skeins of the same length.

This legal standard has remained a dead letter and to abrogate at this late day the principle of unification desired, the means to obtain it will be by the adoption of the standard called international based upon the number of grammes that 10,000 metres of silk will weigh, the test before carrying it into effect being made as in the ordinary manner, upon 20 small skeins of 500 metres.

This standard has the double advantage of being metric and differing little from the standard in price.

In requesting the Minister of Commerce to aid us by all his power in the vote which we desired, we have sought, meantime, to record a reservation at least temporary in regard to the spinning of linen and jute.

The spinners of Lille and Dunkerque have stated that the international commerce of linen and jute yarn is in the hands of England and that as long as the kilogrammetric method of numbering of these yarns has not been adopted by Great Britain, our manufacturers will be obliged to market their products in the same methods of skeining and packing as English yarns.

Our object being to facilitate and not to impede commercial transactions, it appears to us necessary to make cognizance of this fact and admit the reservation formulated in regard to linen and jute.

We desire, on the contrary, in order to press forward this unification that for all the other yarns the governments which adhere to the proposed measures will not be obliged to enjoin in their respective countries the necessary authority, but may not permit the importation of foreign yarns divided in a form deemed illegal by their own nation.

It is what Monsieur VON PACHER expressed very sententiously in his letter of August 29, 1899, to Monsieur ALFRED PICARD, in view of the assembling of this Congress, and I ask permission of you to terminate this long report by a citation taken from that. "It is certain that yarns divided and numbered after the metric system will be unsalable in the greater part of European markets as long as it is permissible to buy or sell yarns divided according to the old systems to which many generations have been accustomed. To force spinners by law to divide and number their products metrically and to allow at the same time foreign countries to import their merchandise, divided according to the old system, would be simply to kill the industry of the former. But by appointing a date when the law would forbid all commerce from using a numbering and skeining other than the metric decimal system, England would be the first to divide and number her yarns designed for exportation according to this rational method."

In summing up, the unification is not impeded by the attachment of the English Government to a system of measures whose merit is that of antiquity, but as we have said before, the principal interests represented by the Chambers of Commerce and by the English scientific men desire the adoption of the metric measures and on many occasions have clearly formed this opinion. We hope, therefore, that the subsequent adoption among our friends beyond the channel will hasten the attainment of this reform of which they will be the first to receive the benefit.

DISCUSSION.

Mr. C. J. H. WOODBURY. It may be conceded as an abstact proposition that uniform standards of weights and measures are advantageous in both manufactures and commerce; and that with the increased use of fabrics woven from yarns of different textile materials, a uniform system of numbering yarns would be a convenience at the weaving mill, yet the suggestion to change the standard of numbering yarns to a basis which would require modifications in every step of the design, manufacture and sale of all machine-made fabrics is indeed a radical proposition.

The serious manner in which these innovations have been considered by a body representing all of the textile manufacturing world, entitles their conclusions to careful consideration, and as a convenience to this end, I have computed the following tables for a comparison of the proposed international metric standard with the present English standard of numbering cotton yarn.

In the proposed system, one metre of number one yarn would weigh one gramme; or changing to our measures by substituting the English equivalents for the metre and the gramme, 1.094 yards of number one yarn would weigh 15.432 grains.

The weight in grains of 120 yards of number one yarn as measured by the proposed international metric standard would be

Weight of yarn: $15.432 = 120 : 1.094$.

Weight of yarn $= \frac{15.432 \times 120}{1.094} = 1{,}692.72$ grains.

To find the number of yarn English cotton standard corresponding to the number of the proposed international metric standard, multiply the international number by .59.

That is, $1{,}000 \div 1{,}692.72 = .59076$.

On the other hand, to find the number of yarn international metric standard corresponding to the English cotton standard, multiply the English number by 1.69

That is, $1{,}692.72 \div 1{,}000 = 1.69272$.

TABLE I.

CHANGING INTERNATIONAL METRIC STANDARD INTO ENGLISH COTTON YARN STANDARD.

Number of Yarn.		Weight of 120 yards, in grains.	Number of Yarn.		Weight of 120 yards, in grains.
International Standard.	English Standard.		International Standard.	English Standard.	
1	.59	1692.72	43	25.40	39.37
2	1.18	847.45	44	25.99	38.48
3	1.77	564.97	45	26.58	37.62
4	2.36	423.73	46	27.17	36.81
5	2.95	338.98	47	27.76	36.02
6	3.54	282.48	48	28.35	35.27
7	4.13	242.13	49	28.94	34.55
8	4.72	211.87	50	29.54	33.85
9	5.31	188.32	51	30.13	33.19
10	5.91	169.20	52	30.72	32.55
11	6.49	154.08	53	31.31	31.94
12	7.08	141.24	54	31.90	31.35
13	7.67	130.38	55	32.49	30.78
14	8.26	121 07	56	33.08	30.23
15	8.85	113.00	57	33.67	29.70
16	9.44	105.93	58	34.26	29.19
17	10.03	99.70	59	34.85	28.69
18	10.62	94.16	60	35 45	28.21
19	11.22	89.13	61	36.04	27.75
20	11.81	84.66	62	36.63	27.30
21	12.40	80.65	63	37.22	26.87
22	12.99	76.98	64	37.81	26.45
23	13.58	73.64	65	38.40	26.04
24	14.17	70.57	66	38.99	25.65
25	14.76	67.75	67	39.58	25.27
26	15.35	65.15	68	40.17	24.89
27	15.94	62.74	69	40.76	24.53
28	16.53	60.50	70	41.35	24.18
29	17.12	58.41	71	41.94	23.84
30	17.72	56.43	72	42.53	23.51
31	18.31	54.62	73	43.12	23.19
32	18.90	52.91	74	43.71	22.88
33	19.49	51.31	75	44.30	22.57
34	20.08	49.80	76	44.89	22.28
35	20.67	48.38	77	45.48	21.99
36	21.26	47.04	78	46.07	21.71
37	21.85	45.77	79	46.66	21.43
38	22.44	44.56	80	47.26	21.16
39	23.03	43.42	81	47.85	20.90
40	23.63	42.32	82	48.44	20.64
41	24.22	41.29	83	49.03	20.40
42	24.81	40.31	84	49.62	20.15

TABLE I — continued.

Number of Yarn.		Weight of 120 yards, in grains.	Number of Yarn.		Weight of 120 yards, in grains.
International Standard.	English Standard.		International Standard.	English Standard.	
85	50.21	19.92	130	76.80	13.02
86	50.80	19.68	131	77.39	12.92
87	51.39	19.46	132	77.98	12.82
88	51.98	19.24	133	78.57	12.73
89	52.57	19.02	134	79.16	12.63
90	53.17	18.81	135	79.75	12.54
91	53.76	18.60	136	80.34	12.45
92	54.35	18.40	137	80.93	12.36
93	54.94	18.20	138	81.52	12.27
94	55.53	18.01	139	82.11	12.18
95	56.12	17.82	140	82.71	12.09
96	56.71	17.63	141	83.30	12.00
97	57.30	17.45	142	83.89	11.92
98	57.89	17.27	143	84.48	11.84
99	58.48	17.10	144	85.07	11.75
100	59.08	16.93	145	85.66	11.67
101	59.67	16.76	146	86.25	11.59
102	60.26	16.59	147	86.84	11.52
103	60.85	16.43	148	87.43	11.44
104	61.44	16.28	149	88.02	11.36
105	62.03	16.12	150	88.61	11.29
106	62.62	15.97	151	89.20	11.21
107	63.21	15.82	152	89.79	11.14
108	63.80	15.67	153	90.38	11.06
109	64.39	15.53	154	90.97	10.99
110	64.98	15.39	155	91.56	10.92
111	65.57	15.25	156	92.15	10.85
112	66.16	15.11	157	92.74	10.78
113	66.75	14.98	158	93.33	10.72
114	67.34	14.85	159	93.92	10.65
115	67.93	14.72	160	94.52	10.58
116	68.52	14.59	161	95.11	10.51
117	69.11	14.47	162	95.70	10.45
118	69.70	14.35	163	96.29	10.39
119	70.29	14.23	164	96.88	10.32
120	70.89	14.11	165	97.47	10.26
121	71.48	13.99	166	98.06	10.20
122	72.07	13.87	167	98.65	10.14
123	72.66	13.76	168	99.24	10.08
124	73.25	13.65	169	99.83	10.02
125	73.84	13.54	170	100.43	9.96
126	74.43	13.43	171	101.02	9.90
127	75.02	13.33	172	101.61	9.84
128	75.61	13.23	173	102.21	9.78
129	76.20	13.12	174	102.80	9.73

TABLE I—continued.

Number of Yarn.		Weight of 120 yards, in grains.	Number of Yarn.		Weight of 120 yards, in grains.
International Standard.	English Standard.		International Standard.	English Standard,	
175	103.39	9.67	188	111.06	9.00
176	103.98	9.62	189	111.65	8.96
177	104.57	9.56	190	112.24	8.91
178	105.16	9.51	191	112.83	8.86
179	105.75	9.46	192	113.42	8.82
180	106.34	9.40	193	114.01	8.77
181	106.93	9.35	194	114.60	8.73
182	107.52	9.30	195	115.19	8.68
183	108.11	9.25	196	115.78	8.64
184	108.70	9.20	197	116.37	8.59
185	109.29	9.15	198	116.96	8.55
186	109.88	9.10	199	117.55	8.51
187	110.47	9.05	200	118.15	8.46

TABLE II.

CHANGING ENGLISH COTTON YARN STANDARD INTO INTERNATIONAL METRIC STANDARD.

Number of Yarn.		Weight of 120 yards, in grains.	Number of Yarn.		Weight of 120 yards, in grains.
English Standard.	International Standard.		English Standard.	International Standard.	
1	1.69	1000.00	16	27.08	62.50
2	3.39	500.00	17	28.78	58.82
3	5.08	333.33	18	30.47	55.56
4	6.77	250.00	19	32.16	52.63
5	8.46	200.00	20	33.85	50.00
6	10.16	166.67	21	35.55	47.62
7	11.85	142.86	22	37.24	45.45
8	13.54	125.00	23	38.93	43.48
9	15.23	111.11	24	40.62	41.67
10	16.93	100.00	25	42.32	40.00
11	18.62	90.91	26	44.01	38.46
12	20.31	83.33	27	45.70	37.04
13	22.01	76.92	28	47.40	35.71
14	23.70	71.43	29	49.09	34.48
15	25.39	66.67	30	50.78	33.33

TABLE II—continued.

Number of Yarn.		Weight of 120 yards, in grains.	Number of Yarn.		Weight of 120 yards, in grains.
English Standard.	International Standard.		English Standard.	International Standard.	
31	52.47	32.26	66	111.72	15.15
32	54.17	31.25	67	113.41	14.93
33	55.86	30.30	68	115.10	14.71
34	57.55	29.41	69	116.80	14.49
35	59.24	28.57	70	118.49	14.29
36	60.94	27.78	71	120.18	14.08
37	62.63	27.03	72	121.87	13.89
38	64.32	26.32	73	123.57	13.70
39	66.01	26.54	74	125.26	13.51
40	67.71	25.00	75	126.95	13.33
41	69.40	24.39	76	128.65	13.16
42	71.09	23.81	77	130.34	12.99
43	72.79	23.26	78	132.03	12.82
44	74.48	22.73	79	133.72	12.66
45	76.17	22.22	80	135.42	12.50
46	77.86	21.74	81	137.11	12.35
47	79.56	21.28	82	138.80	12.20
48	81.25	20.83	83	140.49	12.05
49	82.94	20.41	84	142.19	11.90
50	84.64	20.00	85	143.88	11.76
51	86.33	19.61	86	145.57	11.63
52	88.02	19.23	87	147.26	11.49
53	89.71	18.87	88	148.96	11.36
54	91.41	18.52	89	150.65	11.24
55	93.10	18.18	90	152.34	11.11
56	94.79	17.86	91	154.04	10.99
57	96.49	17.55	92	155.73	10.87
58	98.18	17.24	93	157.42	10.75
59	99.87	16.95	94	159.11	10.64
60	101.56	16.67	95	160.81	10.53
61	103.25	16.39	96	162.50	10.42
62	104.95	16.13	97	164.19	10.31
63	106.64	15.87	98	165.88	10.20
64	108.33	15.63	99	167.58	10.10
65	110.03	15.38	100	169.27	10.00

The SECRETARY. In regard to the proposed diplomatic congress, I wrote the Secretary of State inquiring if anything had been done about it, and have received the following reply from the Assistant Secretary of State:

DEPARTMENT OF STATE,
WASHINGTON, April 18, 1901.

C. J. H. WOODBURY, Esq.,
Secretary, New England Cotton Manufacturers' Association,
45 Milk Street, Boston, Massachusetts.

Sir —

I have to acknowledge the receipt of your letter of the 12th inst. stating that at a meeting of the International Congress for the unification of the numbering of yarns, held at Paris in September, 1900, a proposal for the assembling of an international diplomatic congress for the purpose of putting into legal effect the standards of yarn measurement was unanimously passed, and inquiring whether any preliminary action has been initiated in this line.

In reply I have to say that this Department has no advices whatever on the subject.

I am, Sir,

Your obedient servant,

DAVID J. HILL,

Assistant Secretary.

The SECRETARY. I have also received the following letter, which in translation reads:

FRENCH REPUBLIC.
Permanent Committee of the International Congress of 1900 for the Unification of the Numbering of Yarns.

PARIS, April 16, 1901.

Mr. C. J. H. WOODBURY, Secretary.
New England Cotton Manufacturers' Association,
Boston, Mass., U. S. A.

Dear Sir —

Mr. PAUL FLEURY, Secretary of the Permanent International Committee for the unification of the numbering of yarns, being absent from

Paris for some days, your letter of April 2nd has been opened by the President of this Committee.

In the name of Mr. FLEURY, we thank you for your invitation to attend your annual meeting.

We are pleased to learn that you have placed among the subjects of the programme the study of the results of the Congress held at Paris last year for the unification of numbering. We sincerely hope that the members of your Association will be of the opinion that it is necessary to adopt the standard in America of the metric numbering. We are at your service to give you all the information which can be of use to you.

We will send you, moreover, in three or four weeks, the complete report of the works of the Congress of 1900.

We will be highly pleased if you can inform us the action that has been made at your meeting to the proposition of general unification of the numbering of yarns of all kinds.

Please accept our highest respects.

F. ROY,

President of the Permanent Committee.

The PRESIDENT. Mr. BROOKS.

Mr. CHRISTOPHER P. BROOKS. Mr. President and gentlemen: It seems to me that it should be a matter of gratification to the Association to know that the Secretary has so ably translated the somewhat extensive and complicated report of the International Conference on the numbering of cotton yarns. It is difficult not only on account of the technical phrases in it, but in consequence of the somewhat rambling rhetoric which is noticeable in connection with the discussions of the congress.

As our Secretary has intimated, the recommendations of the congress are that all textile manufacturers of all nations shall adopt as a standard not only for cotton, but for silk, jute, woolen and all other fibres, the standard of No. one's being based on one metre in a gramme or one kilometre in a kilogramme, so that the numbers will be expressed by the number of metres in a gramme.

This is somewhat similar to the present system of numbering yarns used in France and a few other continental countries, with

the difference that at present the standard in France is the number of kilometres in half a kilogramme, so that the international standard that has been recommended by this conference would make the international numbers just double their equivalent in the present French standard. In other words, at present a No. 10 in English standard cotton yarn, which is used in America and in England, is No. 8½ in French, No. 20 is No. 17, No. 100 is No. 85 approximately; but under the new standard what we now call No. 10 would be No. 17 or thereabouts, what we now call No. 20 would be No. 34, what we now call No. 100 would be No. 170.

This system which has been recommended for adoption, and not only recommended for adoption, but recommended for compulsory adoption by legal measures to be taken in each individual country, is theoretically perfect. There are very few men who do not believe in the uniform standard of weights and measures, and it is the opinion of manufacturers and of scientists—more especially of scientists—that the metric system should be adopted as the standard system of measuring quantities and weights and lengths. This system of measuring cotton yarns and all other yarns according to the number of metres in a gramme would be an extremely simple and extremely advantageous system, one which would lend itself to very simple methods of calculation and would further international commerce between different countries in yarns of various kinds.

But while theoretically appropriate and perfect, there are a number of difficulties in the way of its practical adoption. In the first place, the system that has been recommended is the system of a minority of manufacturers. Taking the number of spindles throughout the world as 100,000,000, which it is now approximately, England having 46,000,000; the United States having 19,000,000; the East Indies having 4,000,000; Japan 2,000,000 or 3,000,000, and other countries using our standard of cotton yarns possessing 10,000,000, will give us a total of something like 76,000,000 or 77,000,000 spindles, or at least

three-fourths of the world's manufacturers making yarns at present based upon our ordinary system in which the numbers of the yarn depend upon the number of hanks of 840 yards each in a pound. Of the remaining one-fourth of the spinners and manufacturers throughout the world, the system adopted varies considerably, and possibly not more than 10,000,000 spindles, or one-tenth of the cotton mills of the world, are at present using the French system. The recommendations of this congress would practically force upon the majority of manufacturers the system which is at present in use by the minority. To adopt this system in its entirety, in order to make it commercially satisfactory in every way it would be necessary for us to change over a tremendous number of machines. It would be necessary for the English spinners and manufacturers to change over many of their machines, for the Asiatic manufacturers to do the same thing, more especially with regard to such machines as speeders, mules, warpers, slashers, and other machines where there are indicators which measure the length of material which passes through the machinery. It would be necessary for us to re-cast the whole of our system of calculating costs. It would be necessary for us to adopt entirely new tables as to production and costs in various departments and to thoroughly revise and change our departmental and technical book-keeping throughout the mills. And while, theoretically, the system that has been recommended by this conference appears to be perfect, it seems to me that there are practical difficulties in the way of adopting it which will prevent its adoption by the world's textile manufacturers. Not only so, but it would temporarily, at least, give an advantage to those nations now using the metric system for measuring their yarns; it would give them a temporary advantage in international commerce. Their mills and systems are all organized on the basis of this system, and for a time, if it were adopted, it would give them a temporary advantage until other nations should adopt it. I do not know what the other members of the committee appointed at Montreal say or how they feel with regard to this,

but it seems to me that had the International Congress in Paris last September recommended for adoption our present system of numbering cotton yarns as the standard, it would have been very much more favorably received by manufacturers throughout the world and would have been very much more likely to have been adopted and I feel that it will ultimately be adopted —not by any legislation, not by any conference, but merely from the fact that the United States is gradually and very rapidly increasing its international commerce in textiles, from the fact that Great Britain already has a large hold on the markets of the world, and from the fact that the American and English machinists are practically the sole makers of textile machinery, and will naturally, unless compelled otherwise to do, continue to build their machines and indicators and other measuring mechanism on the present basis.

I feel that the world will gradually adopt our present system of numbering on the basis of the number of hanks to a pound and 840 yards to a hank, without any legislation or conferences, merely because they will be compelled to do so in order to obtain and maintain their share in the world's commerce. The system that has been recommended by this conference is theoretically perfect, but it appears to me practically impossible of adoption because of the practical difficulties standing in the way. I should like to hear the opinions of any other members of the committee or of any one else interested.

The PRESIDENT. Mr. LOWE.

Mr. ARTHUR H. LOWE. Mr. President, I think Mr. BROOKS has very ably presented his views on the subject. I read this report which was sent me by our Secretary, and I came to the conclusion: As the United States or the United States manufacturers were in no way mentioned or referred to, except in one place as "North America," it was evident that we had very little part in the discussion, and I came to the conclusion that the change would only be made when England was disposed to make it. The repre-

sentative from France was of that opinion, the representative from Germany was of that opinion, and the representative from England said, as I recollect, that he had no instructions to commit the English manufacturers at all to the recommendations of the congress. But I am inclined to think that any one who reads the report of this conference and thinks it over in the line that Mr. BROOKS has presented, will come to the conclusion that they are more likely to adopt for the world's standard the present English and American standard than to adopt the standard which the congress recommends, though it has many advantages. The metric system is theoretically a much better system than the present method of sizing and numbering yarns, and its adoption is desirable.

The PRESIDENT. Mr. SANFORD.

Mr. ARNOLD B. SANFORD. Mr. President, members of the Association: When I received word from our worthy Secretary in regard to this matter I gave it some consideration and read over this report very carefully, and the more that I have studied it, begin to come to the conclusion that we shall probably in time arrive at the metric system. Have looked up a little on the matter, and speaking of England, I have a clipping here which says: "The Decimal Association of England has issued its annual report, which states that instruction in the principles of the metric system has been made compulsory in some of the departments of the English common schools, and at the Congress of the Chambers of Commerce of the British Empire, held in London in June last, a resolution was passed recommending that Parliament legalize the metric system in all parts of the British Empire except India."

So it would seem that England is regarding the matter very favorably.

Upon further pursuing the matter, I found, as Mr. BROOKS has stated, that the United States and Great Britain are the only countries that are really opposed to adopting the metric

system; and yet I find that England in exporting her yarns uses both systems; that is, she puts upon each package which she exports to foreign countries both the English numbering and the metric numbering. So we are gradually drifting that way, and if America is going to do an export business—and I am glad to say that within the last six months I have received at least four urgent inquiries from Turkey and other countries in regard to exportation of yarns, actually meaning business and wanting samples and quotations,—we must conform to commercial conditions of foreign customers. Now we on this side, of course, would have to give up our system and adopt this metric system, which seems to be firmly established by our foreign customers. In fact, France adopted it in 1799, and those foreign countries seem to want it. I do not believe but what the English and Americans can adopt the metric system without a great deal of trouble, and it would be rather a compliment for us, Mr. President, to do it. It would show that we could adapt ourselves to the wants of the foreign trade. I do not think there would be any great stumbling blocks in the way. In England today, there are about as many tables for numbering textiles as there are textiles produced. Is not that so, Mr. BROOKS?

Mr. CHRISTOPHER P. BROOKS. Yes.

Mr. ARNOLD B. SANFORD. Now if we could simplify it in that way—at least for cotton, spun silk and woolen yarn, and have one table, it would be a good thing. (I do not think we could bring in the linen and the jute, as it may not be quite feasible yet.) It would enable a man who wanted to produce a certain kind of a fabric requiring different grades of yarn, cotton and woolen or silk, to give his order correctly for the numbers wanted. I frequently receive an order like this: "Please send me 500 lbs. of 50–2ply yarn. At the same time send me 50 lbs. silk or woolen to go with it, the same corresponding length and number." I of course have to turn to the comparative tables to

figure that out. The average purchaser of goods does not seem to carry that information; he expects the spinner or the selling agent to furnish him with it. So I am inclined to believe we are going to come to the metric system. England already, as I say, is advancing in the line, much more than we are, as you may judge by these resolutions which were actually adopted at this English Congress held at London last June. But it would be of no earthly use for the United States to go into it unless Great Britain would go in and make it universal—that is to say, have it come at one time. In order to prepare us for that we want to wait, perhaps, two or three years, and have each government decide upon the date when it shall go into effect. Then we may all come into line and adopt the metric system at a given date. It would be all right then for every government under the sun to take hold of it. But until we come to that point it would be a simple matter of physical impossibility to take it up here. But I believe England is already in advance on that line and is going to adopt that system before a great while. We want to go for the foreign trade, I want to emphasize that, and have an outlet for both our yarns and our goods; and I hope the American manufacturers will pay more attention to that than they have done, and if they do we want to fix our goods the way they want them, number them, label them, pack them as they want them, cater to their wants and not to our own ideas. The sooner we get into that position the better it will be for this country, that is, to seek an outlet for our cotton mills' surplus productions.

Mr. GEORGE OTIS DRAPER. Referring to this question of the unification of the numbering of yarn, it strikes me very forcibly that we of the Anglo-Saxon race are sometimes very unprogressive in comparison to other nations. When we failed to adopt a plan so universally advantageous as the metric system, it is doubtful whether we can hope for any similar advance in any minor field. The attitude of the various representatives at the congress is certainly instructive, showing how England, alone, blocked the way; and yet we, who look with combined

pity and amusement at their continuation of book-keeping in pounds, shillings, and pence, have no right to condemn, so long as we stick to inches, feet and yards.

We have not, as yet, done much of an export business in cotton yarns, so have less need for a unified classification; but we should certainly familiarize ourselves with the International standard.

The PRESIDENT. The next in order is a paper on Overseers and Overseeing, by Mr. CHARLES W. DENNETT of North Adams, Mass. [Applause.]

Mr. CHARLES W. DENNETT. Mr. President, I hesitate before an audience of this description to undertake to talk upon a topic which is so familiar to nearly all of you, but relying upon some little experience both as an overseer and a manager, I will venture to do it. I have thought at least my paper should have one merit—that is, of brevity.

OVERSEERS AND OVERSEEING.

CHARLES W. DENNETT, North Adams, Mass.

The office of overseer is an ancient and honorable one. As far as I am informed it is first mentioned in Genesis. It is said that Potiphar made Joseph overseer over all his house. Undoubtedly the office was then long established and well known. Since human society was first organized on a civilized basis, and wherever numbers of men have united in industrial pursuits, the guiding and directing mind of the overseer has been required. The modern development of the use of machinery and the factory system in manufacturing, whereby large bodies of operatives are brought together under one roof, has developed and increased the demand for overseers and overseerial talent. When the overseer is promoted to the charge of several departments he becomes a superintendent; and in full charge he develops into the agent or general manager, directing the complicated affairs of immense concerns, employing large capital and many operatives. It is the overseerial or managerial talent first displayed by the overseer in the narrow limits of one department, strengthened and developed by training and experience, that leads to success in its larger exercise in the office of superintendent or general manager. There are many men of great executive ability who are successful in the higher place without passing through the lower grades, but there are few who would not have been better prepared for their positions by early training in the duties of overseer. As a rule, the competent and practical managers of our various industries must be sought

among those who have served their apprenticeship and proved their capacity in the overseer's office. It will be seen therefore, that the "overseer" topic is an important one to all manufacturing industries, and especially so in that of cotton manufacturing. As such I invite the attention of the members of this Association to it.

What are the distinguishing qualifications and characteristics of an ideal overseer?

First, he must be a man: a man of character, clean, straightforward, upright. This is a fundamental requirement; it is the foundation upon which the whole superstructure must rest. The most skillful builder cannot make a sound structure out of rotten timber. Neither education, opportunity nor training can transform a deficient man into a sufficient overseer. Owners and managers are under obligations to their communities to see that their overseers are good citizens and fit men to exercise control over large bodies of help, many of whom are women and children. This is good business as well as good morals, and it pays in the long run.

Second. He should have a good knowledge of the work which he directs. Men are often successful in directing work although ignorant of the technical processes, but it is always better to have a thorough knowledge of them.

Third. He should be courageous, industrious, and alert both mentally and physically. Mental slothfulness is one of the greatest dangers, especially to a man who has attained a reputation as a good overseer. Timidity in handling the help is a source of more trouble than is generally supposed.

Fourth. He should have the managerial instinct or capacity. This is the most important of all the qualifications except the first. Without it all other attainments shrink in value or become wholly useless. It is a natural gift, consequently it is paramount to all mere acquirements. Our fathers called it "gumption;" our New England mothers when speaking of it as applied to housekeepers used the word "faculty." Referring to the incompetent housewife, they said she had no "faculty"

for managing or planning her work. Whether it be called executive or managerial ability, gumption or faculty, it is a possession of priceless value, and those most highly endowed with it become our kings of industry. It may not be acquired or imparted, but like all natural gifts it may be trained and developed to a high state of efficiency. Hon. N. W. FARWELL, for whom I worked when a young man, told me that he got his first ideas about managing from a New Hampshire deacon for whom he worked when a boy. He said the deacon always managed to have a *load both ways.* Anyone who ever worked for Mr. FARWELL will not question that he possessed the natural ability to profit by this early suggestion.

Fifth. He should be thoroughly loyal to his employers. Character, technical training, courage, diligence, executive ability, loyalty. These I regard as the principal qualifications of the ideal overseer.

Shadows are needed in bringing out a picture. In trying to paint a portrait of the ideal overseer perhaps a few types of the opposite kind may help to give it life.

TYPES OF INEFFICIENT OVERSEERS.

The first I will call the automatic. I once heard a sermon by a good Methodist preacher, in which he gave the concepts of various schools of thought relative to the attitude of the Deity toward the universe he had created. "One school," he said, "teaches that the Almighty started everything all right and then had nothing more to do with it, but just turned his back on it and let 'er whiz." This is the way the automatic overseer runs his room, or tries to run it. He places his men, issues his orders, makes a lot of rules, gets what he calls his "system" in operation and then turns his back on it and "lets 'er whiz." He has no knowledge of the details of his work, except what comes to him through subordinates, those nearest him who catch on to his system and imitate their chief. The result is that important operations are left to careless workmen, and the work tumbles along instead of being directed. Law won't execute itself in a

cotton mill any better than elsewhere, and the overseer who dosen't look for himself to see that his orders are obeyed is a failure.

The timid type. If the North American Indians operated cotton mills, some overseers would receive the sobriquet of Old-Man-Afraid-Of-His-Help. Lax discipline, poor production, bad quality and high cost are the ear-marks of this type. He is afraid if he enforces obedience to orders he will lose his help; he is afraid if he is short of help the superintendent will be down on him. He dare not take responsibility. If a regulation is to be enforced to which his workmen object, he shifts the burden to his superiors. He says, " I can't help it. The superintendent made the rule," and he implies that if he had the authority he wouldn't do it. The help see through him and work on his weakness. He is always in hot water; they do not respect him and the manager's hair grows grey in the wearisome effort to hold him up. He simply has to be endured; he cannot be cured.

The lazy type. How he got his position I do not know. Perhaps through favoritism, or because he was a good fellow, or possibly in early manhood "about the opening of the bud" he made a supreme effort and succeeded in getting the place which he longed for. He wanted it not merely for the increased pay, but because he imagined if he got an overseer's position he could rest. His deficiencies are too numerous to be catalogued. He looks at everything from the point of view of his besetting fault. Ask his advice about some change or improvement; you do not get a disinterested answer. If it will make it easier for him he will favor it; if not, he is opposed. He is a weak spot in an organization where ceaseless industry and vigilance are necessary to compel success.

The crooked type. He is a combination of the lazy and the timid, with an essentially dishonest make-up for a foundation. He will neglect his work and lie about it. Bad work he saddles on some other department. You find it difficult to enforce a regulation in his room. He talks fair to you about it and se-

cretly opposes it. When I was superintendent I once had such a man in my employ. The agent made a regulation forbidding the bringing of breakfasts into the mill after starting time. I found great difficulty in enforcing the rule in his department. By watching carefully I discovered that he was systematically violating the rule by having his own breakfast brought in by a back door to which he had the key. At the same time he professed to be doing all possible to enforce the rule. The crooked overseer will falsify his reports to lower his costs and give men time which they do not work, and thus indirectly increase their pay. He talks against the mill and the management when he thinks he can do so with safety. Discontent and strikes originate in his department. He is a menace to any organization and should be kicked out without ceremony.

But enough of the shadows. The foregoing naturally suggests the question, Why are inefficient or incompetent men tolerated? The answer is ready. It is because competent and efficient men cannot always be found. I think the majority of managers of middle age will agree that there is not as much good material for overseers in the mills today as there was twenty years ago. For some reason our young men of education prefer to try law or medicine or some so-called genteel vocation rather than the mill, and yet an assured income of from one thousand to fifteen hundred dollars per year for a service of fifty-eight or sixty hours per week, with the average opportunity of advancement, is preferable to the work and compensation of fifty per cent. of the lawyers and doctors. Many are looking to the textile schools to remedy the deficiency and they will no doubt render valuable aid in this direction, but as we have seen, technical knowledge is only one item in the equipment of an overseer. Nothing can take the place of natural fitness supplemented by actual experience in the mill. Men in charge know that a much larger per cent. of faults and failures in a cotton mill is chargeable to lack of attention and management than to the lack of technical information.

I believe as one method of providing more material for over-

seers we should encourage boy graduates of our high schools to go into the mill and work, and if they are interested, urge them to go to the textile school and give them a place when they graduate. But I will leave the further discussion of this important question to the Association and will close with a word about the treatment of oversees.

I believe in giving overseers a vacation without loss of pay and holding them responsible for results in their department just as if they were there. If a room is not organized so that it will run a week or ten days without the boss, there is something wrong and it is well to be aware of it.

I think an overseer should have perfect freedom to discharge all the duties pertaining to good citizenship. He should not be debarred from holding office, especially unsalaried offices where no special draft is made on his time during working hours. Such offices, for instance, as councilmen and aldermen in cities. All regulations restricting freedom in this direction tend to lower the social condition of the man and lessen his importance in the estimation of the community, and as a further consequence prevent ambitious and self respecting men from choosing a vocation subject to such limitations. In a word, treat your overseers as you liked to be treated when you were in the same place.

[Prolonged applause.]

The PRESIDENT. It sounds very much as if somebody would like to say something. The opportunity is now at hand, if anyone has any remarks upon that subject. It is an important one.

Mr. ARNOLD B. SANFORD. The gentleman's paper has been very interesting and we all thank him for it. There is one thing he spoke of which appeals to me, and that is about the young man just out of school. I have tried to place in the mill no less than three of that kind of young men, and you have no idea what opposition there is to it. It ought not to exist. I have a young man now who is just coming out of school. He has been in the Philadelphia Textile School two years and he wants to get into a fine mill to learn the business, and I have tried three mills and cannot get him in. They say, "We have no room for such a man; we do not want him." The young man says, "I don't care anything for the pay; I will sweep floors, I will scrub, I will advance myself along and I want to get into the mill business." What are you going to do with such a man? Why not give him a chance? If anybody here wants such a young man, I have him — clean as a smelt. Don't all speak at once.

The PRESIDENT. We will proceed to the next subject in order, Some of the Troubles to Manufacturers Arising from Dyed Yarns, by Mr. FARQUHARSON J. MUIR, of Milltown, New Brunswick. [Applause.]

SOME OF THE TROUBLES TO MANUFACTURERS ARISING FROM DYED YARNS.

FARQUHARSON J. MUIR, Milltown, New Brunswick.

INTRODUCTION.

I am sure you will readily agree with me, that in the manufacture of cotton cloth in the grey, there are troubles enough constantly cropping up, but when you proceed to the coloring of your yarns for stripes and checks, these troubles materially increase, because you have added a number of elements, each involving a process of its own.

There are various methods or systems of yarn dyeing, which require different preparations for the handling of the yarn in the dyehouse, as for instance,

(*A*) Skein dyeing, which involves reeling, kier boiling, vat or hand dyeing, hot room drying and skein winding.

(*B*) Scotch system or long chain dyeing, which requires chain warping or balling machinery, boiling, dyeing, drying by can or hot air, and beaming.

(*C*) Bradford system, which in principle is like the Scotch but is used mostly for short chains, the main difference being in the tub having three compartments.

(*D*) Then there is raw cotton dyeing, which has been developed largely in the last few years, on account of the vast progress made in producing good one dip dyes, and where these can be used, a great saving is made over yarn dyeing, as the number of operations is reduced.

(*E*) Again, we have piece goods dyeing, or dyeing of the manufactured product, either in jiggers or compartment boxes.

Each of these, as the saying is, has "troubles of its own", but the subject is very extensive and we will confine ourselves in this paper, to some of the troubles arising from long chain dyeing.

THE SHADING OR MATCHING OF COLORS.

One of the most difficult problems manufacturers of yarn dyed goods have to solve, is to have piece after piece of cloth of the same pattern, come out, to all intents and purposes, of uniform shade, and principally for the reason that the long chain system affects this, has it come into favor. By it, in most cases, all the separate colors forming the pattern, can be dyed at one time, and the filling, even if solid, can be dyed in one set, as from 400 to about 600 or 700 pounds can be dyed together.

With your foreman dyer rests the responsibility of matching the shades, but such a combination of elements enters into even one shade, that sometimes his is a most arduous task, for you will often find that a certain shade has been dyed satisfactorily for seven or eight times, then without any apparent cause, the shade will get "off." Now, were all the ingredients that go to make up a specific shade, chemically pure and uniformly manufactured, and were you to use pure H_2O, and have your cotton all one shade, then the dyer would be at fault and might be justly blamed, but it is impossible to procure in commerce, all of these things, nor is it practical to test chemically, every dye stuff and drug that your dyer uses, and return those in which a variation is found. Most colors require what your dyer calls a bottom, viz., tannin, usually in the form of sumac, then he fastens the tannin with, say tartar emetic, washes off the free acid, and then puts on his color. Now, as we said before, he may have dyed the same shade, seven or eight times, and had them all match, but the next time his color gets "off," and he may find that a new barrel of some drug has been opened, or if he gets his water for dyeing from a river, it may be the water if analyzed,

would show an increase of lime, and he has now got to patch up the color to get it to shade. This almost in every case, requires the adding of some dye not used in the former shade.

Then, too, the drying or sizing of the yarn may affect it differently, so that the colors in the finished goods, fail to match the original. And let us say, the skill of your dyer will be best shown in such cases, as the most difficult part of this trade is to "doctor a shade."

HOT PIPE MATCHING.

Another cause for non-uniformity of shade is met with in matching and drying a sample on a hot pipe. The drying of the bulk on dry cans or hot air dryer, often gives a different cast and it is the practice of most dyers to match his shades a second time after the chains have been dryed and aired.

The standard shades by which the various colors are matched, should have systematic care bestowed on them, as they will fade and become dirty by handling, and if your standard changes, how can you hope to keep a uniform shade in your goods. Many mills make it a practice to have all standard shades emanate from the designing room, as the sample of cloth made by the designer, is the accepted pattern. The shades are taken from the same yarns as in the sample, and given to the dyer and beamer, and the latter is instructed to match every chain before beaming, as should an "off shade," by carelessness or any other cause, get into the beaming room, it may yet be saved and touched up if caught before being put on the beam.

SLASHER CHANGE.

Again, you are liable on your slasher, to meet with another element of change in shade, for should the size be on the acid side, you will find it will affect many colors, especially those made from an alkaline basis. It is very essential therefore that the overseer of your dress room, should be supplied with litmus so he can keep his size neutral. If the goods are finished after

weaving, the same care must be used there as in the dress room.

BLEEDING ON SLASHER.

This is a source of great trouble to many an overseer of dressing, and can be greatly remedied if not altogether eliminated by the dyer having an intelligent knowledge of the composition of each pattern, that is, he should have a list sent him showing which colors go together to make up each and every pattern. In this age of keen competition, it is the constant aim of every overseer to run his department with the strictest economy. Should he therefore not know which colors are run together on the slasher, he may be tempted to cheapen some one of them, by making it less fast, thereby wrecking the whole pattern. This is a common case in black, which will bleed into the white and destroy the brilliancy of the pattern when finished. The slasherman may again, obviate some of this, by a careful study of the acid or alkaline condition of the size. In this connection, we have known of puzzling problems arising from very simple causes, as for instance, a mill dyeing cotton in the piece with benzopurpurine (an alkaline color) had their goods turn black at the selvages, and they spent many an anxious hour to ascertain the cause, which at last proved to be due to the wet goods after dyeing and before drying, being placed in close proximity to some acid, the fumes of which, acted upon the exposed parts and turned the red black.

LEASING TOO TIGHT.

The chains when prepared on the chain warper for the dyehouse, are leased to facilitate rebeaming. In the dyehouse, also, in most cases, these chains are doubled together before dyeing, and are leased by the dyer to facilitate splitting them down again to their original size. In both these leasings care must be exercised, for if they are put in too tightly, they will prevent the dyestuff from penetrating at this point, and your goods will show a white mark across them, which is very puzzling to anyone not familiar with the process of long chain dyeing.

CARELESS HANDLING IN DYEHOUSE.

Every thread broken in the warp not only requires time to repair it in the beaming room, but of necessity adds another knot to go through the harness eye and the reed, and increases the liability of hitchbacks in the cloth, or the stoppage of looms for warp repairs. Careless handling in the dyehouse will therefore react to a considerable extent on your production. The dyer usually doubles four or five chains together to reduce the length of run in dyestuff, and tangles frequently occur, which require patience and skill to unravel successfully.

Another source of trouble is the top squeeze roll on the dye tub. This is manipulated by hand leverage, and a careless workman may fail to lift the roll in time to let the end of the yarn enter. As a result, the yarn is bruised and will often fall apart when stretched on the beaming frame, and the dyer will hear the complaint that the yarn was "acid burned" in dyeing, or was made tender by chemicals used, when the real cause may often be traced to the bruising at the squeeze roll.

When splitting the warp so as to reduce the bulk to the original chains, unless intelligently done, a great many ends will be broken. You will readily see, therefore, that it is of the greatest importance, that while in the dyehouse, the yarn should be handled with the greatest care.

BITTING YARN.

As all threads broken from whatever cause, have to be pieced up in beaming, the operator must needs have spools of the same number and color as the yarn he is working on, and these colors must be constantly renewed and rematched, else you will find a solid beam streaked by threads of different shade, caused by the bitten yarn being darker or lighter as the case may be.

ELECTRICITY.

Electricity is another source of annoyance, but can be readily overcome by aging the yarn.

SIZING OF WARPS.

The sizing of colored warps is a subject too comprehensive both in the composition of the sizes used, and in the effect of size on different colored yarns — to go deeply into, in this paper. Let us but state, that the effect of the sizing compound on grey work, is entirely different from colored work and that each color takes the size in a different degree. This is caused by the nature of the dye used, or its chemical action on the cell walls of the cotton fibres.

For example, if we have a pattern to dress, composed of dark indigo blue, a light aniline shade of blue and grey yarns, and we size these in one box on the slasher, as we would a grey warp, we will find that the light blue shade will be smooth and wiry, because the yarn being first bleached before dying, the cells of the fibre absorb a large quanity of the size. The grey yarn will have the proper amount of size necessary for good weaving, while the dark indigo blue will be soft and fuzzy and probably chafe in the harnesses and reed, because indigo being a surface dye, has already filled up the cells, and the yarn rê-sists the size. The effect of this on the weaving will be readily understood.

These are some of the difficulties of colored work, and although we have not attempted to provide the cures for the many ills, yet we trust the mere bringing of them in detail before this meeting, may have been of interest to its members.

Mr. CHARLES W. DENNETT. I just want to say a word to my brother sufferers who run colored mills, supplementary to the admirable paper to which you have listened. There is a great deal in comparing the dyed goods with the sample. You know how a dyer will bring a sample to you, all rolled up tight and slightly wet; he will put a little bit of the dye on it and squeeze it down so that you can see how hardly any of it looks, and you think you will have a match. Open your skein and look at it, and perhaps you have got three or four shades. I never let a dyer by any means have two samples, because he will try it on one and if it is a little off he will try it on the other, and if it is wrong he will say it is the fault of the sample. Always follow him and see just what he does. Sometimes the dyer will say it is the soil where the cotton grew that will make a difference in the shade. But it is a fine thing to look out sharp for the sample and keep him right up to it. According to my experience there are very few dyers that can tell the difference between the hue and the tone of a color; they are satisfied if they get about the right cast. Perhaps it is too low, perhaps it is too high; perhaps you have got the wrong tone. It looks very well in the little sample, but when you get it in your piece of goods it is a different thing altogether.

The PRESIDENT. We will proceed to the next paper entitled, A Little Study in Lug Straps for Broad Drop Box Looms, by FRANK P. VOGL, Claremont, N. H. The Secretary will read the paper.

The SECRETARY. Mr. President, I have received a letter from Mr. VOGL stating that he is unable to be here today. This paper he has sent in answer to a request which I made of him to write a short practical paper, and in that respect is as good as any paper ever presented before the Association.

A LITTLE STUDY IN LUG STRAPS FOR BROAD DROP BOX LOOMS.

FRANK P. VOGL, Claremont, N. H.

The figures following represent the cost per pound of goods manufactured for lug straps in years specified, viz:

Year ending Nov. 30, 1896,	.000442
" " " " 1897,	.000413
" " " " 1898,	.000862
" " " " 1899,	.000252
" " " " 1900,	.000211

For many years we have been using straps made of canvas and raw hide, canvas inside and raw hide outside, and with satisfactory results but in the early part of 1898 I noted the straps did not last as long as formerly and the raw hide seemed weak; after complaining to party furnishing our straps with no better results, I commenced trying stitched leather and other styles of straps but we still used too many, and, after a trial on a few looms, early in 1899 we adopted the Roller Cushion Lug Strap, and the cost per pound of goods manufactured in the years 1899 and 1900 justifies the change. I give this small item from my experience in hopes it may help others, and also as an aid to our worthy Secretary in his efforts to have more short papers from members of Association on the every day happenings that come under their observation and notice.

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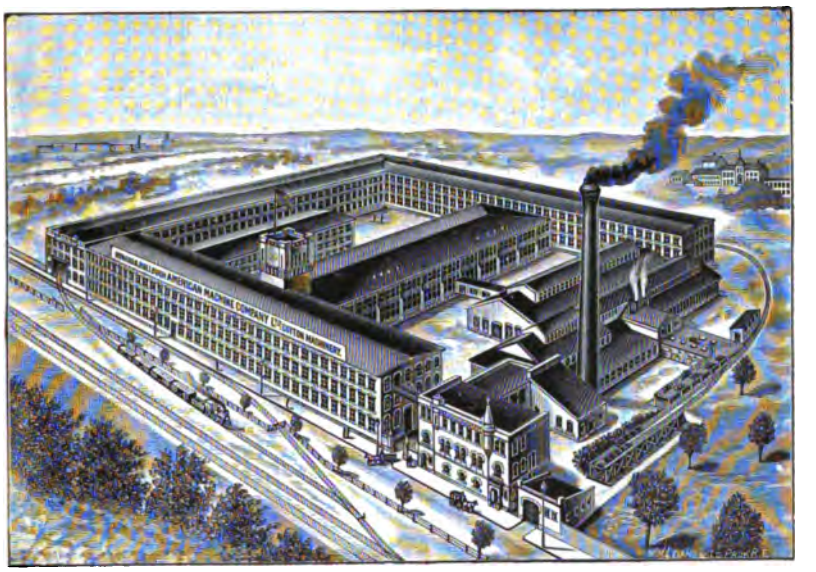

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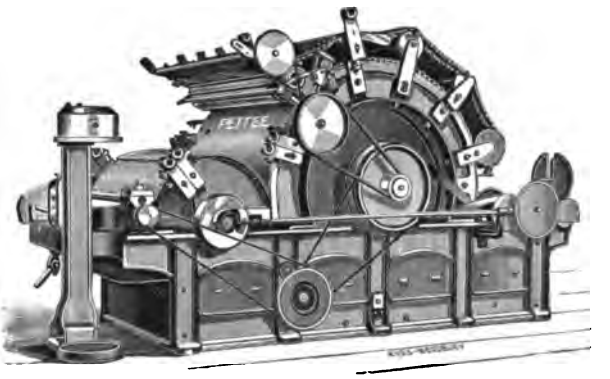

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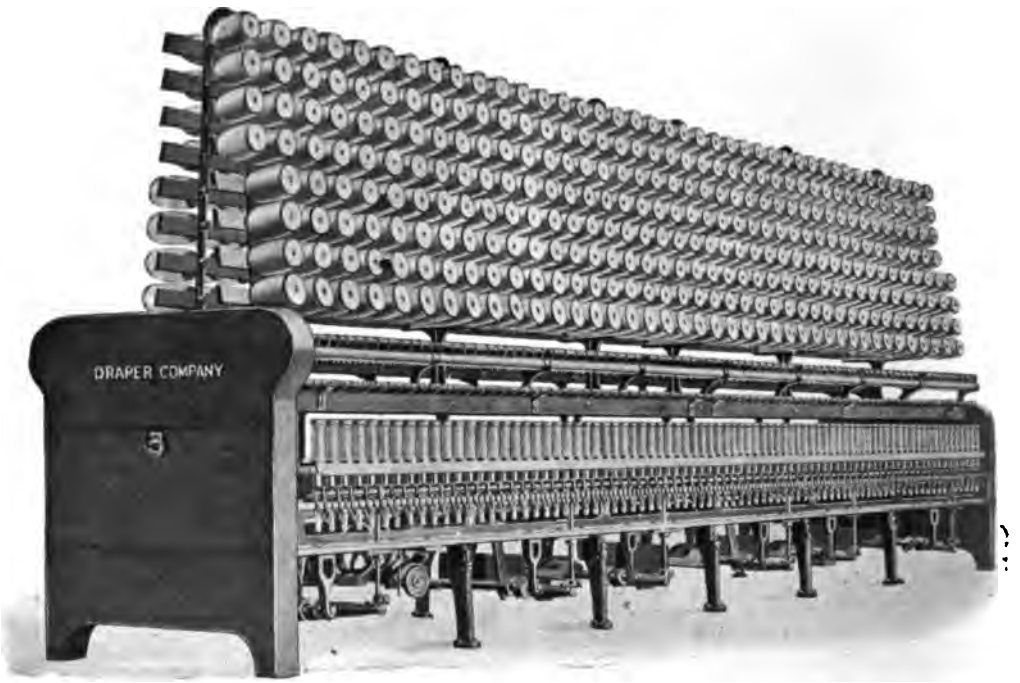

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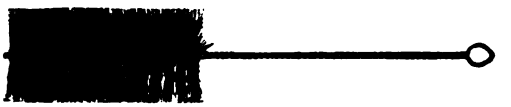

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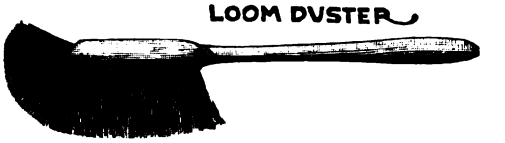

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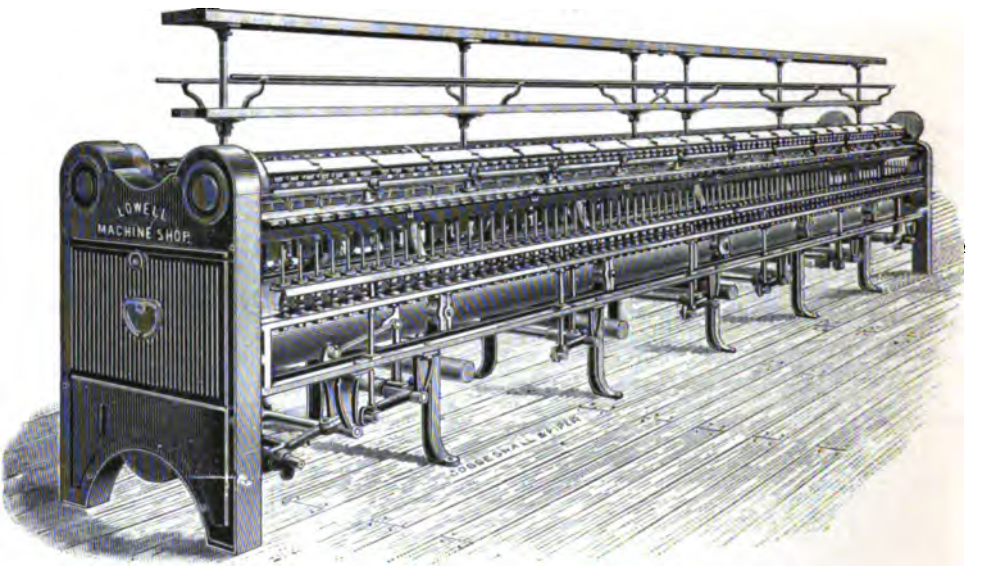

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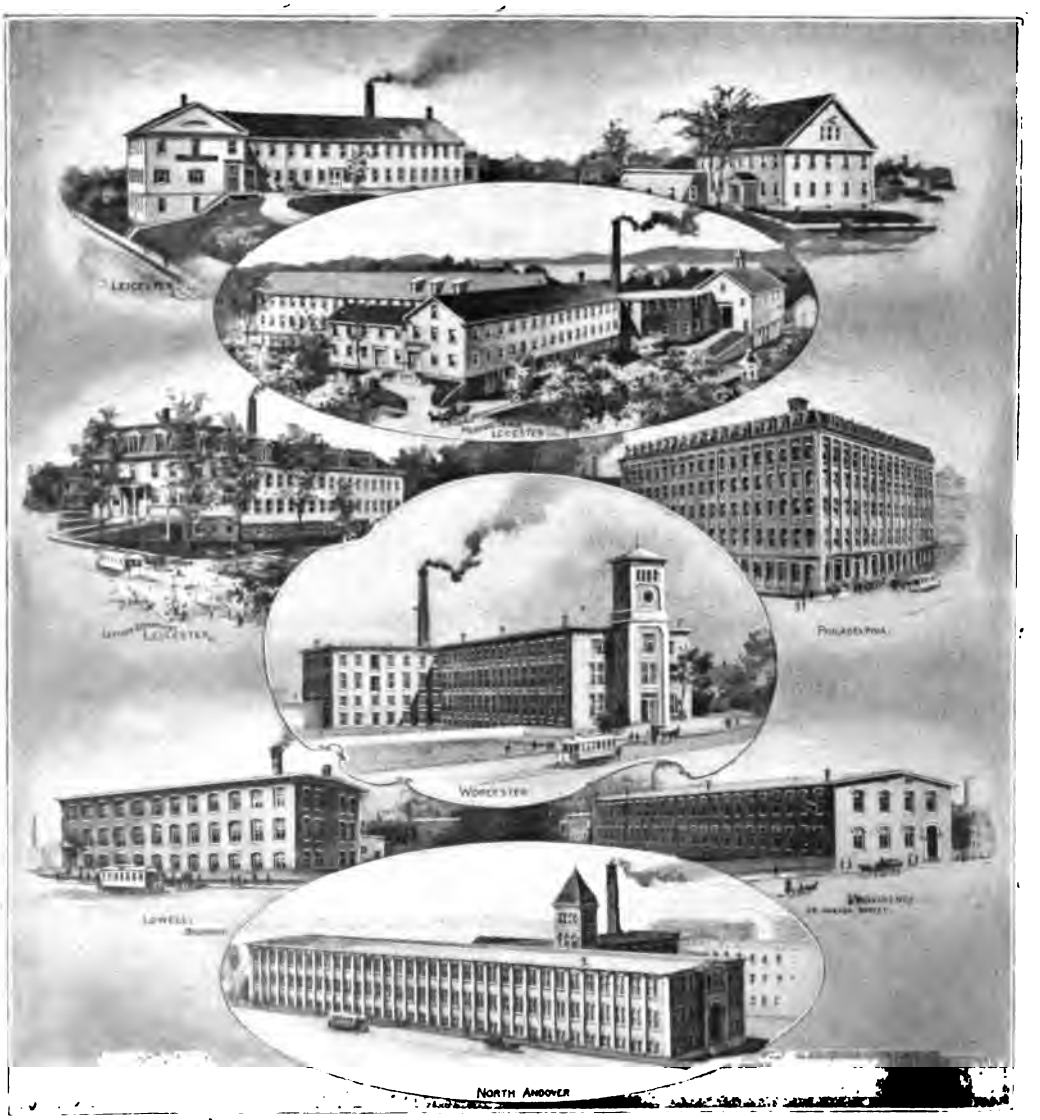

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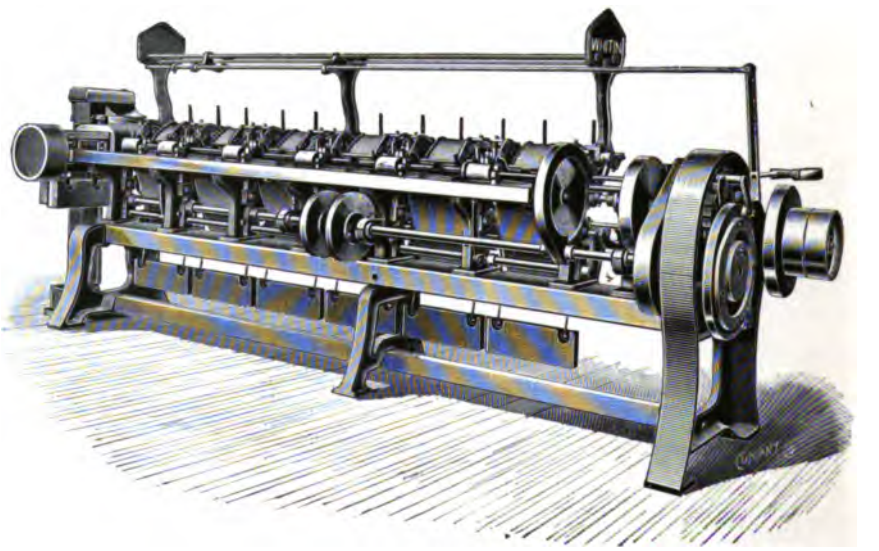

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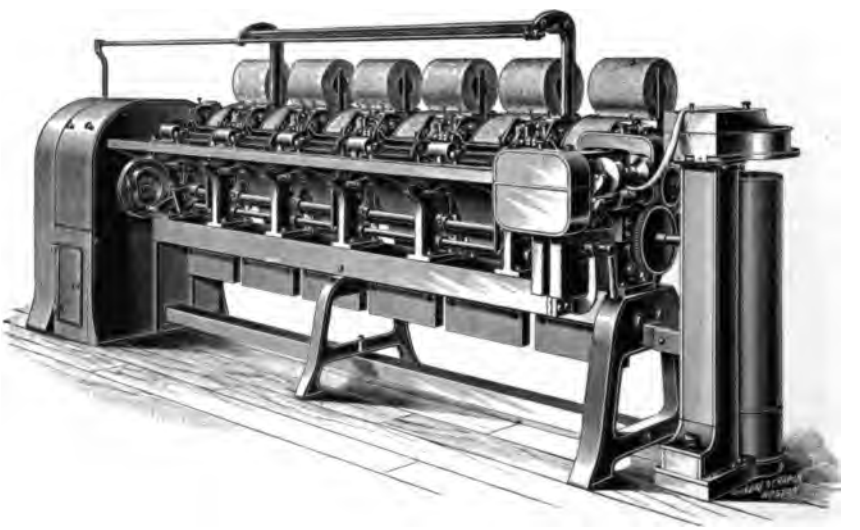

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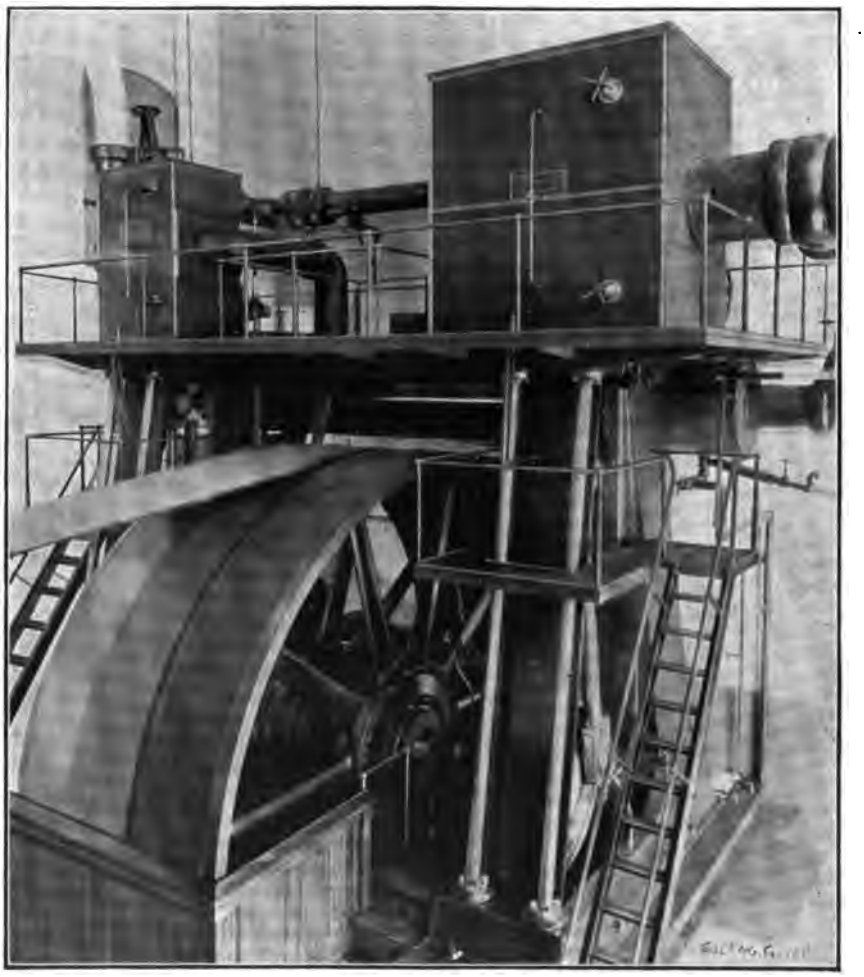

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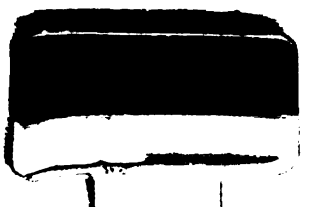
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